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AVIATION SAFETY LETTER

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Letters with comments and suggestions are invited. All correspondence should include the author's name, address and telephone number. The editor reserves the right to edit all published articles. The author's name and address will be withheld from publication upon request.

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CASS 2008 Reminder

The 20th annual Canadian Aviation Safety Seminar, CASS 2008, will be held April 28–29, 2008, at the Hyatt Regency hotel in Calgary, Alta. The theme for CASS 2008 is *Managing Change: The Impact of Strategic Decisions on Personnel and Processes.*

The Canadian civil aviation industry has long recognized the benefits of multi-disciplinary skill sets for its next generation of aviation personnel, and the need for proven organizational processes. CASS 2008 will provide an excellent opportunity to discuss how best to achieve this. Through interactive workshops with colleagues and specialists, followed by presentations in plenary by aviation professionals, delegates will be offered strategies and ideas to bring back to their organization for continued improvements in safety. For information on CASS 2008, please visit www.tc.gc.ca/CASS.

GUEST EDITORIAL

It is my pleasure to contribute to the *Aviation Safety Letter* (ASL) on behalf of the International Operations Branch. There have been a number of changes in the Branch during the last year, starting with the consolidation of international activities by moving the Foreign Inspection Division to International Operations. The Foreign Inspection Division is responsible for the certification and safety oversight of all foreign air operators conducting commercial air services into and out of Canada, as well as approving overflights of Canada and technical landings at Canadian airports.

The International Operations Branch has several other very interesting roles, including co-ordinating international aviation environmental issues and providing Information Management / Information Technology (IM/IT) support to the Civil Aviation Directorate. The Information Management, Technology and Support Division provides technical and strategic advice to internal and external clients, colleagues, and senior management, and oversees a portfolio of over 40 national informatics applications in a variety of environments and configurations.

Another important activity of the Branch is co-ordinating Canadian participation for aviation safety issues at the International Civil Aviation Organization (ICAO). As one of the 190 ICAO member States, we are very active in developing these international standards. Transport Canada's technical experts participate in a long list of ICAO panels, working groups, and committees that develop ICAO standards. We are very fortunate to have the headquarters for ICAO here in Canada, since many of these meetings are held at the ICAO headquarters in Montréal, Que.

Often, ICAO standards are controversial because their impact can be greater on some countries than on others. To fully understand the impact of our decisions on our stakeholders, we are encouraging more stakeholder involvement in the development of these standards. I look forward to working closely with stakeholders early in this process to develop future standards.

For details on other activities of the International Operations Branch, I encourage you to visit our Web site at: www.tc.gc.ca/CivilAviation/international/menu.htm.

Robert Shuter
Director
International Operations

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Concerned with flight in marginal weather

Dear Editor,

I am a former Master Mariner and a retired Nautical Science and Search and Rescue Instructor with the Canadian Coast Guard. Having always been interested in aviation, I decided upon my retirement to get my private pilot licence, to which I added a night rating. Air travel is considered to be the safest means of transportation, where safety is achieved through a highly-regulated industry. There appears to be, however, an area in airline operations where precise rules seem to be lacking, the consequences of which can prove to be very alarming.

Over the past decades, there have been a number of grave accidents in the airline industry that have been weather-related, and which seem to obey the same pattern. Those accidents involving heavy casualties and the destruction of large airliners seem to have been caused by the captain's insistence to challenge the weather and "make the runway" no matter what.

As a side note, my first flight instructor lost his life a few years ago, along with two other passengers, as his captain insisted on landing during a snowstorm after a first attempt failed. Some airline flights had been cancelled due to the existing conditions. Many more cases have been documented.

In flight, weather is the "great equalizer," where experienced to low-time pilots are all treated the same way. All pilots were taught about diversions, holding patterns and how to stay out of harm's way. In discussions I had with experienced pilots, it would appear that scheduling factors, as well as potential expenses incurred by a diversion, are amongst the pressures to complete a landing in spite of marginal conditions. I am not aware of any regulation that drastically prohibits reckless attitudes and behaviours, but I would be interested to hear your opinion on this serious matter.

Régis Serre
Cornwall, Ont.

Thank you Mr. Serre. Canadian carriers have an excellent safety record of following established procedures and safe practices with regards to weather factors. The implementation of safety management systems (SMS) integrates safety into policies, management and employee practices, as well as operating procedures throughout the organization. SMSs offer the most promising means of preventing these types of accidents in commercial operations. While I am confident that the attitudes and behaviours of Canadian pilots meet a very high standard, I believe the publication of your letter is a meaningful reminder to all of us who fly. —Ed.

Flying clubs as partners in the aviation safety system in Canada

Dear Editor,

Kudos to the COPA (Canadian Owners and Pilots Association) and the *Aviation Safety Letter* (ASL) for recognizing the important role of flying clubs as partners in the aviation safety system in Canada ("COPA Corner—Flying Clubs—Why Bother?" by Adam Hunt, ASL 4/2006).

Although flying clubs have long been recognized for their central role in training, many also provide a broad range of services for their rental and owner membership. In the case of the Calgary Flying Club, we support on-going learning and skill maintenance for our members through initiatives, such as safety seminars, and the offer of an annual free check-ride with one of our instructors. One has to wonder why so many aircraft owners choose to "go it alone" when they could have the camaraderie and support that can be found at their local club.

David L. Mapplebeck
President, Calgary Flying Club

Clarification on ASL 3/2007 letter to the editor on engine failure and fuel management

Additional information has been received regarding an event described in a letter to the editor, titled "Engine failure," which appeared in the Aviation Safety Letter *(ASL) 3/2007. Unfortunately, the writer partly attributed uncorroborated blame to his employer at the time, and such comments unsupported by facts would normally be edited out. There is evidence to indicate that the aircraft was in fact properly dispatched for fuel, and that company procedures were in place to avoid such an incident. The intent of the letter was to convey awareness of proper fuel management practices by pilots. The ASL apologizes for this editorial oversight. —Ed.*

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NAV CANADA Adopts International Best Practices

In today's global aviation industry, it is critical to share data and information between aviation organizations in order to streamline and standardize air traffic control procedures encountered by aircraft crossing multiple international boundaries.

Taking this idea a step further, in 2005, NAV CANADA's ATS Standards and Procedures established a working group whose mission was to review existing international procedures that could potentially reduce delays or fuel burn with a view to implementing them in Canada.

In order to quickly benefit from these procedures, rather than "re-invent the wheel," NAV CANADA set out to adopt existing international procedures wherever possible, on the condition that they demonstrated an acceptable safety record, and were adaptable to the Canadian regulatory climate.

Before adopting an existing international procedure as its own, NAV CANADA conducts a rigorous safety review of the procedure and the context in which it is used in the host country. This safety review begins with a thorough examination of all existing written documentation, including a review of any applicable regulatory material. Then, any existing safety analyses that the host country is able to provide are reviewed, and any operating irregularities involving the procedure are examined.

At that point, visits to the countries in question are scheduled. Training facilities may be visited prior to individual site visits to better understand the nationally-mandated application of the procedure.

Site visits involve watching the actual procedure in action and talking to front-line staff and management regarding any concerns they may have about the procedure. It is not uncommon to receive suggestions from operational staff as to how the procedure might be improved.

Next, draft Canadian procedures are designed and subjected to a national hazard identification and risk analysis (HIRA) process involving operational air traffic controllers, pilots, and airline operators. The procedures are then subject to a second "operational level" HIRA at an initial trial site to determine if there are any site-specific issues to take into consideration before implementation.

Mitigations are put in place, where possible, for hazards that are identified. If mitigations are not possible, then the actual procedure is re-considered. Just such a case occurred when NAV CANADA considered introducing conditional instructions into Canada.

Before the trial begins, air operators and pilots will be advised of the new procedures through an aeronautical information circular (AIC). Implementation of the new procedures is monitored by national and local management on an on-going basis, and is overseen during regular visits by NAV CANADA ATS Evaluations and Investigations inspectors.

Once the trial has been successfully completed, the procedures are subject to a HIRA at any additional sites under consideration for implementation.

To date, this process has been successfully used in the implementation of multiple landing clearances at five major airports in Canada, as well as the development of new visual separation procedures soon to be introduced at various sites across the country.

A very similar process has been used for several years by NAV CANADA, when introducing home-grown procedures.

If you would like more information on the safety analysis process for the introduction of new operational procedures, please contact Randy Speiran, Manager, ATS Standards and Procedures, NAV CANADA by e-mail, at speirar@navcanada.ca, or by phone, at 613-563-5659. △

COPA Corner—Buzzing at a Fly-In Is Illegal

by the Canadian Owners and Pilots Association (COPA)

So, you are coming into a fly-in, and you decide to do a low approach, make a high-speed pass down the runway, and then pull up before joining the circuit. You see that there are lots of people there because the fly-in was widely advertised in town. Oh well, who is it going to hurt; you aren't breaking any rules, are you? Maybe you had to pull up and go around anyway, right? *Canadian Aviation Regulation* (CAR) 603.01 states:

"No person shall conduct a special aviation event unless the person complies with the provisions of a special flight operations certificate—special aviation event issued by the Minister pursuant to section 603.02."

Was your buzz job a special aviation event? The term "special aviation event" is defined in CAR 101 as:

"An air show, a low level air race, an aerobatic competition, a fly-in or a balloon festival."

Was your buzz job an air show? The term "air show" is also defined in CAR 101:

"An aerial display or demonstration before an invited assembly of persons by one or more aircraft."

Was your buzz job a demonstration? If you did not perform a standard approach, a normal overshoot and climb-out, followed by a normal cross-wind and then down-wind, it could easily be established that you were performing a demonstration, and therefore, an air show that was in direct contravention of CAR 603.01 because you did not have an operations certificate. Note that the assembly of persons just has to be invited, not "paying."

CAR 103.08 lays out the penalties for non-compliance with the CARs. Violations of CAR 603.01 carry a maximum penalty of a $3,000 fine for individuals and $15,000 if a company owns your airplane.

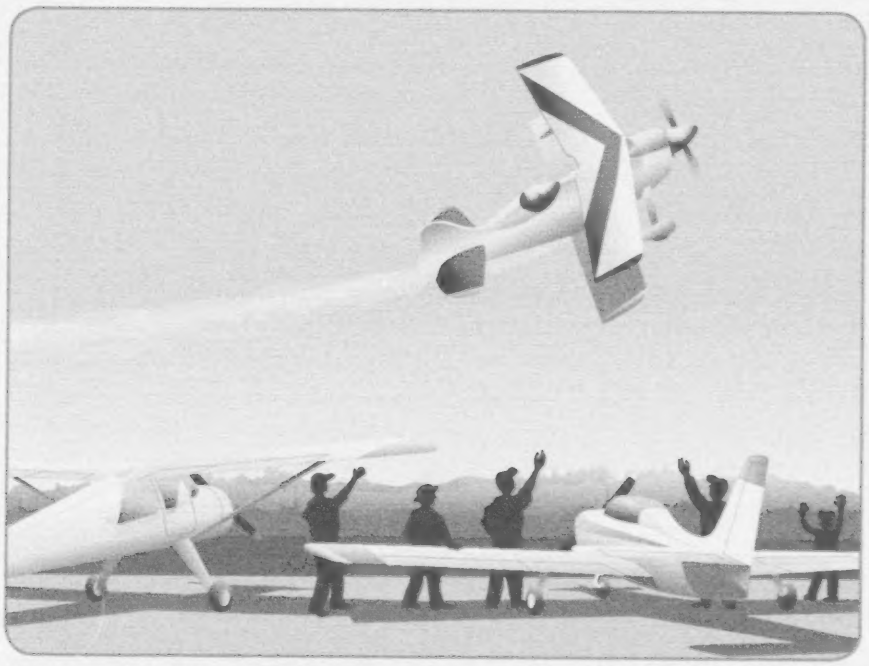
If Transport Canada (TC) thinks that your "buzz job" was a hazard in addition to an illegal air show, then you could also be charged under CAR 602.01, which states:

"No person shall operate an aircraft in such a reckless or negligent manner as to endanger or be likely to endanger the life or property of any person."

CAR 103.08 specifies the maximum penalty for that offence as $5,000 for individuals and $25,000 for corporations.

Pilots who feel the need to show off are imperilling the very existence of fly-ins in Canada. TC inspectors have informed COPA that some pilots are acting recklessly at fly-ins in the name of showing off, and consequently, TC has been pressing for more control over fly-ins. COPA has been opposing more control by TC over fly-ins, but every time another pilot cannot resist the urge to show off it makes COPA's arguments less effective. The end result may be that fly-ins will disappear in Canada, buried under a mountain of paperwork requirements that will make them impossible to hold.

If that happens, it could be because some pilots couldn't just show up at a fly-in and land their plane—they had to show-off and "buzz" the airport. Please think about the consequences, and if you see someone showing off, urge them to stop for the sake of our freedom to fly. For more information on COPA, visit www.copanational.org. △



Buzzing is not only old hat, but unprofessional, illegal, and dangerous.

Battery "Bewareness"

Fires can potentially erupt from lithium batteries in-use and carried onboard aircraft.

The following is an excerpt from an article published in the July/August 2007 issue of FAA Aviation News. *It was written by Terry Pearsall, an Aviation Safety Inspector with the General Aviation and Avionics Branch in Flight Standards Service's Aircraft Maintenance Division, and adapted for the* Aviation Safety Letter *(ASL) by Roger Lessard, Civil Aviation Safety Inspector, Dangerous Goods Standards, Standards, Civil Aviation, Transport Canada.*

Portable equipment manufacturers and the general public alike are using lithium batteries to power the latest notebook computers, DVD players, digital cameras, portable drills, cellular phones, and many more devices like these. In portable equipment, lithium batteries provide hours more capacity than their predecessor power sources of lead oxide, nickel cadmium, alkaline, and other disposable batteries. The weight savings and increased capacity lithium batteries provide, however, do not come without risks of fire that can erupt from mishandling or misuse.

Presently, users of this technology, ranging from wireless telephone manufacturers to the electric vehicle industry, have noted significant safety concerns regarding the use of these types of batteries. In December 2005, the U.S. Federal Aviation Administration (FAA) first learned of fires erupting from laptop batteries and issued Safety Alert for Operators (SAFO) 05008. Subsequently, Transport Canada published Commercial and Business Aviation Advisory Circular (CBAAC) No. 260 in March 2007, alerting crew members to be aware of the potential for smoke emission and fire propagation from high-energy batteries of any kind.

Chemistry class

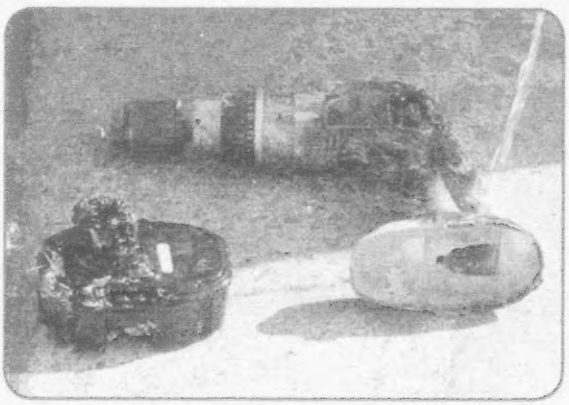
By design, all batteries operate through a controlled chemical reaction to generate an electrical current and transmit power through terminals made of a conductive metal. It is their capacity to perform that basic function that makes them useful; but, if not properly handled, designed, or manufactured, it poses a risk of overheating and fire. The newest generation of batteries using lithium metal (Li) or lithium ion (Li-Ion) technology pose particular risks, based on their energy density and chemistry, and because fires involving these batteries are more difficult to extinguish or suppress. Even nickel cadmium and nickel metal-hydride batteries can generate large amounts of current and heat when short-circuited.

Passenger precautions

The *Transportation of Dangerous Goods Regulations* (TDGR) forbid the transportation of electrical devices that are likely to create sparks or generate a dangerous quantity of heat, unless packaged in a manner that precludes such an occurrence. Passengers carrying batteries or electrical devices in carry-on or checked baggage are responsible for ensuring that the appropriate steps are taken to protect against dangerous levels of heat that can be generated by inadvertent activation or short-circuiting of these devices while in transport. The following precautions should be taken:

- Keep batteries installed in portable electronic devices. When replacing with a spare battery during flight, handle batteries with care and pack used batteries safely.
- Pack spare batteries in carry-on baggage.
- Keep spare batteries in the original retail packaging.
- If original packaging is not available, use a sturdy, re-sealable plastic bag and cover the battery terminals with insulating tape, such as electrical tape.
- Do not carry on board a plane recalled, damaged, or counterfeit batteries. Passengers should only use batteries purchased from reputable sources. Cordless power tools, for instance, should be packed in a protective case, with a trigger lock engaged.
- Always ensure that the battery or spare battery is the type and model specified by the manufacturer of the device it will be used to power.

As with any product, manufacturing defects can also cause safety problems. Manufacturers have voluntarily recalled over 10 million lithium-ion batteries in the last few years. Information about recalled batteries can be found on the manufacturer's Web site or from the Health Canada Consumer Product Safety Web site (www.hc-sc.gc.ca/cps-spc/index_e.html).



Example of a battery-operated portable drill inappropriately packaged in checked baggage

Cargo casualties

There are ancillary hazards from transporting lithium batteries in cargo containers aboard aircraft. A number of incidents recently reported in the United States sparked the FAA Office of Aviation Research to conduct a series of tests to assess the flammability characteristics of non-rechargeable lithium batteries. The results of the tests indicate that:

- A relatively small fire source is sufficient to start a primary lithium (metal) battery fire.
- None of the fire-extinguishing agents, including Halon 1301, currently in use within cargo compartments on U.S. commercial aircraft, is effective in extinguishing primary lithium fires.
- The ignition of a primary lithium battery releases burning electrolyte, which can perforate cargo liners and propagate a fire to other locations in the passenger compartment.

The FAA researchers tested batteries from a number of manufacturers. They found that:

"A relatively small fire source is sufficient to start a primary lithium battery fire. [...] Halon 1301, the fire suppression agent installed in transport category aircraft, is ineffective in suppressing or extinguishing a primary lithium battery fire. Halon 1301 appears to chemically interact with the burning lithium and electrolyte, causing a colour change in the molten lithium sparks, turning them a deep red instead of the normal white. This chemical interaction has no effect on battery fire duration or intensity. The air temperature in a cargo compartment that has had a fire suppressed by Halon 1301 can still be above the auto-ignition temperature of lithium. Because of this, batteries that were not involved in the initial fire can still ignite and propagate. The ignition of a primary lithium battery releases burning electrolyte and a molten lithium spray. The cargo liner material may be vulnerable to perforation by molten lithium, depending on its thickness. This can allow the Halon 1301 fire suppressant agent to leak out of the compartment, reducing the concentration within the cargo compartment and the effectiveness of the agent. Holes in the cargo liner may also allow flames to spread outside the compartment. The ignition of primary lithium batteries releases a pressure pulse that can raise the air pressure within the cargo compartment. The ignition of only a few batteries was sufficient to increase the air pressure by more than one pound per square inch (psi) [6.9 kilopascals (kPa)] in an airtight 10-meter-cubed pressure vessel. Cargo compartments are only designed to withstand approximately one psi [6.9 kPa] differential. The ignition of a bulk-packed lithium battery shipment may compromise the integrity of the compartment by activating the pressure relief panels. This has the same effect as perforations in the cargo liner, allowing the Halon 1301 fire suppressant to leak out, reducing its effectiveness."

Final thoughts

Manufacturers of batteries and consumer products, as well as airlines, testing laboratories, emergency responders, the law enforcement community, and others, continue to respond to real incidents and accidents caused by Li and Li-Ion battery malfunctions. Fortunately, in all of the reported incidents, crew members were able to successfully locate the source of the smoke or fire and combat it effectively with the equipment and techniques available to them. Nevertheless, over the next few months Transport Canada and other International Civil Aviation Organization (ICAO) Dangerous Goods Panel members will discuss the issues and actions to enhance battery transportation safety.

In the meantime, airlines are reminded of their existing obligations under the TDGR and Transport Canada policies. △

BLACKFLY AIR

Hey, Mal Here's Nick with our new helo. I had to lure him away from Redeye Air.
You wouldn't believe how hard it is to find an experienced pilot these days...
Redeye Air!?
Hello Mrs. Black, nice to finally meet you. Your husband speaks very highly of you.
Ha! Pa's got more hours lying than flying. Let's cut to the chase Nick, what did Pa do to make you join us?
Well, he offered room and board, better pay and benefits, a cell phone and a management position.
Great. Did he tell you where the room is?
You'll need a really warm parka...

Facing Conflict Within a Non-Punitive Safety Management System (SMS)

by Theresa Dunn, Director, Corporate Development, Canadian Business Aviation Association (CBAA)

There seems to be an assumption among academics and regulatory bodies that there is a critical mass of people in the aviation community who will face conflict through open, proactive self-reporting. Conflict is defined as tension between the values and expectations of a regulatory standard, and the reality within a protective and productive business environment. Self-reporting is understood as a quality of the safety culture that is the foundation for a safety management system (SMS).

The concept of culture, that is, human activity and the structures that give activity significance, establishes a system of choices, goals, and actions. In an attempt to establish a uniform standard of activity within the aviation community, a model of a just and safe culture has been proposed by academics, such as James Reason, and regulatory bodies, such as Transport Canada.

The concept of a just culture will be discussed here, since it encompasses the aspects of a safe culture. Briefly, a just culture is one in which the people involved share leadership and responsibility for the safety and stability of the work environment. Moreover, a clear line of accountability is drawn to support those times when a judgment of wrongdoing and appropriate justice is required.

A model to implement the qualities of a just culture is found within the expectations of an SMS. One fundamental expectation is that all members of the SMS will assume a role of leadership in reporting faulty or weak technology and human elements. Yet, as often happens, how the system is to be lived out is not well understood.

For example, the expectation for self-reporting of incidents or near misses (defined broader than just near-miss aircraft accidents) assumes the ability of people to overcome their discomfort, if not outright fear, of facing conflict in an open and transparent manner.

Self-reporting incidents and near-miss accidents are wisely identified as important components of a system that is meant to be proactive and preventative in nature. Nevertheless, what is lacking are instructions on how to bridge the gap between the individual's experience of being at fault, or identifying fault and not assuming blame. The experience, personally or within the existing corporate culture, likely includes negative consequences of being the bearer of bad news. There is clearly a gap between the ideal and reality.

To address this gap it is essential to understand how we deal with conflict. Generally, people have a repertoire of reactions when faced with a problem where they may not feel powerful enough to orient the situation to their advantage (or protection, if you will).

In North America, the consequences of conflict have been associated with loss. We are all born in a state of less power. Subsequently, we may have been in conflict with what we wanted or needed, and what our caregivers wanted or needed. Most of us have had varying degrees of experience with someone bigger than us yelling or hitting (intimidation), or using silence (rejection) to control us when we wanted attention for something. Children, with their limited understanding, relate these actions to a loss of affection, or a serious loss in their sense of value. These situations result in a social script that defines what conflict means to us and which skills to employ under different circumstances. As a result we, as adults, may fear the same loss when we are faced with a situation that threatens our status with those who have power over us.

In the workplace, very little is different. Those in power often direct the way and content of the conflict resolution process. When a problem arises, senior officials may often take responsibility, but it is the subordinate who bears the consequences. To assume that, as adults, we can simply self-report failings in our workplace that implicate us or our co-workers, and ignore that this self-exposure is a huge social leap in expectations, is naïve at best. Self-reporting is possible, and it is important, but it is not an easy or natural act.

In order for self-reporting to be a viable option within an SMS, we must relearn what we believe about conflict. We must set up infrastructures that make the challenge worth the risk. We must collectively support each other in trying out these methods in our day-to-day activities. We need to experience respectful and mutual benefits as a result of these attempts.

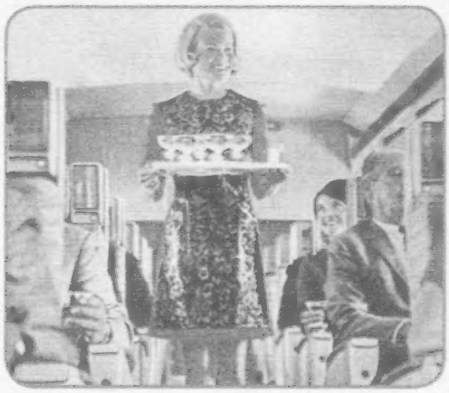
Nevertheless, a just culture is not the figment of someone's imagination. The ability to deal with conflict without blame, unless someone has stepped over the line of accountability, is happening now. We need to identify the occurrences that are successful, and hold these as examples of how sharing the responsibility for a just work environment occurs. Until there is a critical mass of people who are competent at facing conflict, our corporate and regulatory systems will be struggling to identify potential and real risks through a fog of self-defence. △

Cabin Safety: Alcohol Alert

by Sue Rice. Reprinted with permission from the September–October 2006 issue of Flight Safety Australia.

With drug and alcohol testing expected to be introduced for safety-sensitive personnel sometime in 2007, over-consumption of alcohol by passengers is likely to come under increased scrutiny.

Intoxicated passengers are more than just annoying to passengers and staff. They also pose a risk to their own safety and the safety of others because they may not be in a fit state to follow instructions in an emergency. Alcohol impairs almost all forms of mental activity, including decision making, memory, vigilance, and reasoning. It also adversely affects physical co-ordination.



In the past, service of alcohol was glamorized. Now, cabin crew are expected to serve alcohol responsibly.

Drunken passengers are a real safety risk, especially if there is an emergency. They may be unable to adequately comprehend instructions, and their physical ability to follow emergency commands may be impaired.

Some passengers may drink too much because of their fear of flying, some because they are celebrating the start of a holiday or an important occasion, and some because in normal life they are heavy drinkers.

Apart from the safety risk in an emergency, intoxicated passengers present a problem for maintaining order on the aircraft. Alcohol consumption has been reported as a factor contributing to 45 percent of on-board incidents according to U.S. research. In Australia, there is plenty of anecdotal evidence that drunken passengers are a problem.

Sometimes a passenger will board your aircraft looking fine, but two drinks later, they are slurring their words and carrying on. What happened? This kind of "drunk-in-an-instant" passenger has usually had a few at the departure lounge or a nearby bar, and it only takes a drink or two to tip him or her over the edge. It's hard to detect how much alcohol someone has already had, but it soon becomes apparent when they start misbehaving.

Airline operators in Australia have provided cabin crew with training that helps them manage passengers who are behaving badly. The key is to communicate with the passenger in a way that avoids confrontation. You should be sensitive to the passenger's background, adjusting your style to match the passenger's gender, age, status and whether they are in a group or alone. For example, you would approach a drunken executive in first class in a more formal style, appealing to their sense of decorum. If that doesn't work, you could slow the service right down, and hope that they fall asleep.

When all else fails, you have to say no (see box). You should never apologize for refusing someone a drink—you have a responsibility for safety. Follow your company procedures and refer to the laws about responsible service of alcohol. Obviously, you are not allowed to serve alcohol to anyone under age, and if you suspect someone is too young to drink, you should ask for proof of age.

Execs and dinnerware: The male executive was in his early 50s, very tall and heavy set. He was quiet and there were no signs of aggression. However, within the first two hours of the flight, he had consumed eight miniatures of vodka, equivalent to around 16 standard drinks. He got away with it because he kept ordering from different flight attendants. In the end there was no more vodka left on the B737.

The flight attendant approached him quietly, sat in the empty seat next to him and introduced herself, saying, "Mr. X, we have a bit of a dilemma; it has come to my attention that you have consumed a large amount of vodka. I will need your co-operation, as we must follow the responsible service of alcohol legislation." He seemed a bit shocked, but he said he understood, and the flight attendant thanked him for his co-operation. He was quiet for the rest of the flight. That's the ideal situation. But things can go wrong, especially in a group situation where sometimes people encourage each other to behave badly.

How to say no

- Be polite, yet firm.
- Say that you are concerned for their safety in the flight environment.
- Ask for their help to ensure that safety and order are preserved.
- Remind them that you have an obligation under responsible service of alcohol.
- Offer a non-alcoholic drink and food as an alternative.
- If the situation is getting out of control, inform the captain and consider closing bar service.

We've all heard about problems with intoxicated footballers flying home after a game, or to a holiday destination at the end of the season. On one flight to Honolulu some years ago, a team on their end-of-season "jolly" became a bit more than just rowdy: they were vomiting, urinating in the aisles, throwing food, shouting, and pulling seats apart. They were already well on their way to intoxication when they boarded, and that is where they should have been stopped. But they got through.

What do you do when things go horribly wrong like this? Your first step is to inform the captain of the situation, as there may need to be law enforcement arranged upon arrival. Rowdy and offensive behaviour is against the law. [Australian] *Civil Aviation Regulation* (CAR) 256AA says, "a person in an aircraft must not behave in an offensive and disorderly manner." You may need to protect the other passengers by moving them away from the area, if possible. Try to identify who the leaders of the group are, and appeal to their leadership to help you to calm the situation down.

Rise in risky drinking—women catch up:
The latest published information shows that there has been a rise in the number of people drinking at risky or high-risk levels since 1995. The increase has been greater for women, with the proportion of "problem drinkers" rising from 6.2 percent in 1995 to 11.7 percent in 2004–05. Over the same period, the proportion of men drinking alcohol at levels that might adversely affect their health rose from 10.3 percent to 15.2 percent.

Men are not necessarily more aggressive than women. A few years ago, 120 Australian and New Zealand dinnerware sales representatives were on board an airliner on their way to their annual conference. They were in high spirits, ordering a lot of drinks. It soon became clear that some had had a few before they got on. They did not turn nasty, but they were making an awful lot of noise. The flight attendants got together and decided on a strategy: they would slow the drinks down to a trickle. On this occasion it worked, and with some friendly persuasion the women settled down.

Airlines can take pre-emptive action if they are alert to the risks. That's exactly what one responsible company did before they carried athletes to a certain series of world title matches. Anticipating trouble, the airline sent out letters to the clubs reminding them of their responsibilities to maintain good order on the flights. There were not to be any incidents of drunkenness or bad behaviour, or they would be refused carriage for the return trip. It worked. There was no trouble because each club had "read the riot act" to their players and supporters before the flights.

Fact File

- One in five Australians drink at high-risk levels at least once a month.
- Australians aged 20–29 are the most likely of all age groups to drink at high levels.
- Intoxication usually refers to a blood alcohol concentration above 0.05 or 0.08 percent, but this is not universally agreed. To stay below this level, men should have no more than two standard drinks in the first hour, and one per hour after that. Women should have no more than one standard drink per hour.
- Intoxicated persons cannot function within their normal range of physical and cognitive abilities.

Not on: You should try to spot trouble before it starts. Refuse entry to anyone you suspect is intoxicated before they enter the aircraft. If someone looks and smells like they are drunk, they probably are. You could invoke the law, as [Australian] *Civil Aviation Regulation* (CAR) 256, paragraph 1 states, "a person shall not, while in a state of intoxication, enter any aircraft." So what are the signs? They might be any or all of the following:

- talking loudly, quickly or with slurred speech;
- sweating;
- sleepy;
- red faced;
- vomiting;
- unco-ordinated;
- argumentative.

All operators carrying passengers should have policies and procedures in place to guide pilots, flight attendants and ground staff on the management of alcohol consumption.

If you suspect someone is intoxicated, you should follow company procedures. Do not directly accuse them of being drunk. What you should say is something along the lines of, "excuse me, would you mind just stepping aside for a moment; someone will be with you shortly." Then you should contact ground staff who should follow company procedures to prevent an intoxicated person entering the aircraft.

If you are in doubt about any aspect of alcohol service, ask your manager.

Sue Rice is a cabin safety inspector for the Australian Government Civil Aviation Safety Authority (CASA). △

FLIGHT OPERATIONS

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Civil Pilot Training: Some Changes in the Offing

by Carl Marquis, Civil Aviation Safety Inspector, Flight Training, General Aviation, Civil Aviation, Transport Canada

Traditional approaches to civil pilot training have not significantly changed over the past several decades; however, soon there will be an alternative for those aspiring pilots wishing to pursue a career in commercial airline flying.

Are we providing the most efficient training methodologies for those students wishing to pursue employment in the airline industry? Are we certain that they are adequately prepared to meet the demands of modern-day transport-category aircraft? Have our training approaches kept pace with advancements in technology and simulation capabilities? Are we too focused on attaining prescribed entry-level requirements as opposed to achieving the required competencies to do a job? Have we confused the issue between prescribed hours of "exposure" and the real definition of the term "experience"? These questions may be thought-provoking, and once posed, the answers will certainly stir debate.

At the request of the Air Navigation Commission, the International Civil Aviation Organization (ICAO) established a Flight Crew Licensing and Training Panel (FCLTP) to review ICAO's Annex 1 to the *Convention on International Civil Aviation—Personnel Licensing*. It consisted of 64 participants, including members and observers nominated by 18 contracting States and 5 international organizations. This Panel was to take into consideration the significant advances in technology and the increased complexities of pilot work environments since the previous review was conducted, some 20 years earlier.

Among the recommendations made by the Panel was the need for some directional changes with respect to current licensing practices. This involved the expanded use of simulation, the determination of more relevant training standards, and the creation of a new licensing structure. Those changes are now reflected in ICAO's Annex 1 and their *Procedures for Air Navigation Services—Training* (PANS-TRG) document, which came into effect on November 23, 2006. Of particular significance is that this publication provides guidance for the implementation of a new internationally-recognized pilot licence—the multi-crew pilot licence (MPL).

The decision that Canada would proceed with rulemaking for the MPL was announced at the Civil Aviation Regulatory Advisory Council (CARAC) Plenary meeting in December 2006. Since the MPL is dependent upon the training being conducted by an approved training organization (ATO), the rulemaking endeavours will include developing the components necessary for the Canadian certification of an ATO.

This new aviation document will signify that the holder has successfully undergone a Transport Canada-authorized MPL flight training program, and has demonstrated the competencies to perform the duties of a co-pilot of a multi-engine, turbine-powered airplane under either VFR or IFR conditions. In other words, the holder can be employed as a first-officer with an airline in a multi-crew environment. Because of reductions in traditionally-prescribed actual flight time exposure requirements, there are anticipated to be some restrictions attached to the MPL that are not necessarily associated with the more familiar pilot licences. For instance, holders of an MPL will only be able to exercise the privilege of their instrument rating while flying as a co-pilot. Furthermore, depending upon the makeup of the completed MPL training program, the holder may not have achieved all the prescribed requirements necessary to obtain a private pilot licence. This situation could, therefore, prohibit a commercial airline pilot who is type rated on a Dash-8, for instance, from flying solo in a Cessna-172.

The issuance of an MPL will follow the completion of a rigorous and continuous four-phased training course designed specifically for the ab initio (zero flight time) candidate. Prior to commencing the program, candidates will be subjected to a careful selection process to identify the existence of those attributes believed to best optimize the chances of success. Then, throughout the syllabus, the focus will be on the students' ability to consistently achieve benchmarked levels of skill, knowledge, and attitudinal competencies. A critical element in all this is the continuous development of desirable behaviours and management skills through the adaptation of the principles taught in crew resource management (CRM) and threat and error management (TEM) training.

MPL Training Scheme
Minimum 240 hours of training including pilot flying (PF) and pilot not flying (PNF)

	Phase of training	Training items	Flight and simulated flight training media—minimum level requirement		Ground training media
Integrated TEM Principles	**Advanced** Type rating training within an airline orientated environment	· Crew resource management (CRM) · Landing training · All weather scenarios · Line-oriented flight training (LOFT) · Abnormal procedures · Normal procedures	Aeroplane: turbine, multi-engine and multi-crew certified	12* takeoffs and landings as PF	· Computer-based training (CBT) · E-learning · Part task trainer · Classroom
			Flight simulation training device (FSTD) Type IV	PF/PNF	
	Intermediate Application of multi-crew operations in a high performance multi-engine turbine aeroplane	· CRM · LOFT · Abnormal procedures · Normal procedures · Multi-crew · Instrument flight	FSTD Type III	PF/PNF	
	Basic Introduction of multi-crew operations and instrument flight	· CRM · PF/PNF complement · IFR cross-country · Upset recovery · Night flight · Instrument flight	Aeroplane: single or multi-engine	PF/PNF	
			FSTD Type II		
	Core flying skills Specific basic single pilot training	· CRM · VFR cross-country · Solo flight · Basic instrument flight · Principles of flight · Cockpit procedures	Aeroplane: single or multi-engine	PF	
			FSTD Type I		

* *May be reduced*

Figure 1: Illustrative of attributes of an MPL program

To accomplish all the desired outcomes will necessitate a robust quality assurance (QA) system and an on-going evaluation process designed to immediately detect and effectively deal with student performance deficiencies.

The development of a performance-oriented syllabus will require an instructional systems design (ISD) approach, with emphasis on defining progressive levels of individual knowledge, skill, and attitudinal competencies. This will generate a learning environment focused on the outcomes of each training event and the continuous improvement of student performance. This type of program will need to be backed by an exacting validation process, which will be heavily dependent upon data collection and airline feedback once the student enters the workforce. There may even be a need for the creation of a national MPL advisory board to ensure continued refinement of processes and course content.

As mentioned earlier, the delivery of an MPL course is dependent upon it being conducted by an ATO. To that end, a new regulatory framework dealing with the TC-certification of ATOs is currently being developed. The intention is that the associated regulations and standards will be "performance-based" in nature. This approach to rulemaking recognizes that the traditionally prescriptive, one-size-fits-all regulatory structure often unnecessarily complicates the process of achieving the desired results. The proposed regulations and standards will then tend to centre more on identifying "what" is required rather than dictating to industry "how" they must achieve those requirements. An interesting feature afforded by such an outcome-based approach is that these organizations will be permitted to seek approval for "alternative means of regulatory compliance" with the requirements prescribed in the *Canadian Aviation Regulations* (CARs). The proviso is that the ATO's proposal to deviate must ensure an equivalent level of safety and conform to the original intent of the regulation or standard. This provision will represent a huge enabler for this type of training service provider to make innovative and cost-effective decisions. This is due in large part to the benefits of possessing a highly developed and effective QA system—a system that is excellent at identifying risks and instituting effective control measures to mitigate them. This QA system will be mandated through regulation for all ATOs to gain and retain their certification.

The development of a performance-based environment recognizes the close relationships that ATOs offering

MPL programs will inevitably form with air carriers. The same will be true with those that choose to augment their business model by providing initial type rating, recurrent, and specialty training to commercial air operators under contract. This type of flexibility will inevitably be helpful in permitting the ATO's services to conform to both the regulatory environment and the operational needs of the client air carrier.

Currently, this initiative is a work in progress being managed by a team within Transport Canada Civil Aviation (TCCA). Members of the team have experience in both airline operations and the provision of crew training services. Notwithstanding, we are working closely with organizations that have expressed an interest in offering MPL training programs and gaining certification as an ATO. Our intention is to continue to expand our communication efforts with the many stakeholders in the industry, and we look forward to receiving your feedback as the ATO-MPL project moves forward. Should you or your organization wish to receive electronic communiqués or offer comments regarding this initiative, please e-mail the ATO-MPL Program Coordinator at norrisl@tc.gc.ca. △

Fly Only As Fast As You Can See

by Bob Grant, Civil Aviation Safety Inspector, Aerodromes and Air Navigation Standards, Standards, Civil Aviation, Transport Canada

This article is an updated version of "Don't Fly Faster Than You Can See...", also written by Bob Grant, which was originally published in Aviation Safety Vortex *1/1998. The article is based on research from veteran safety expert Gerard M. Bruggink. Since only the relatively small* Vortex *audience had the chance to read it, we felt it would be beneficial to publish it again, 10 years later, in the* Aviation Safety Letter. *—Ed.*

You are flying just above the hills and trees, trying to maintain visual contact with the surface, with a visibility of less than 1 000 ft. You're watching for obstacles, hoping that when they loom out of the grey, you'll have enough room and time to make an evasive turn. You're very uneasy...no, you're frightened. You should have turned back 20 min ago...but you didn't. You've reduced your airspeed from 100 kt to 80 kt.

How much forward distance will you travel from the moment you see an obstacle until you complete the first 90° of an evasive turn? If your total forward travel exceeds the existing forward visibility, you're in big trouble. The Transportation Safety Board of Canada (TSB) could attribute your demise to: "flight into low ceiling and visibility conditions."

We all slow down—at least I hope we do—when we encounter fog or snow while driving our cars because of the reduced visibility. We should use the same protective instinct when flying. That being said, a fixed-wing aircraft can only be slowed to just above the stall speed.

Figure 1 is based on the assumption that it takes about 5 s to perceive the problem, make a decision, and then initiate a corrective action. You can argue that it won't take 5 s to react, and you could be correct—it may take more than 5 s. The forward distance traveled during these five seconds—in no-wind conditions—is a function of true airspeed (TAS), and is shown by the straight line on the lower portion of the graph. At 80 kt, the aircraft's forward displacement in 5 s is 676 ft.

Assuming that the escape manoeuvre consists of a coordinated turn, it is obvious that the first 90° will bring

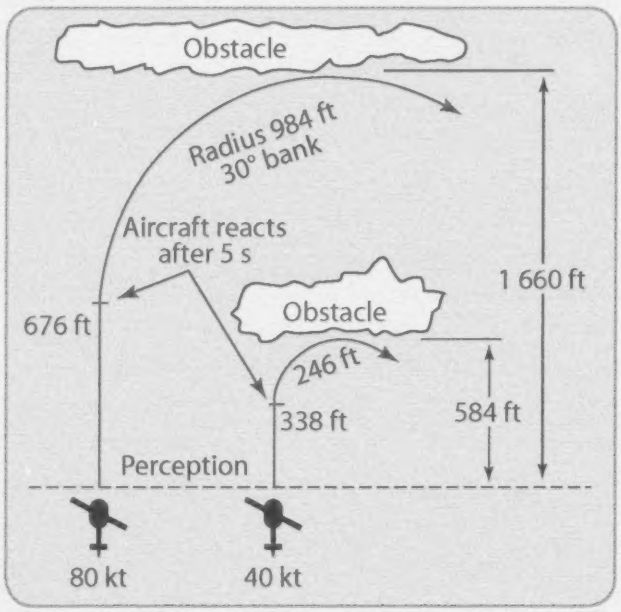


Figure 1

the aircraft closer to the obstacle over a distance equal to the radius of the turn. For reference purposes, a bank angle of 30° is used as a standard. At 80 kt, this would produce a turn radius of 984 ft (and a rate of turn of 8°/s). Therefore, the total displacement of the aircraft toward the obstacle, from the moment of perception until the completion of a 90° turn, would be 676 + 984 = 1 660 ft. With a given visibility of 1 000 ft, your problem is simply the lack of 660 ft to manoeuvre in. In other words, impact becomes inevitable unless you engage in some last-second acrobatics, which would probably only produce a more spectacular mishap.

What would your chances be if you reduced your speed to 40 kt (if you could as in a helicopter) with the same 1 000-ft visibility? A look at Figure 1 shows that your total forward displacement in that case would be 338 + 246 = 584 ft. This would give you an approximate 400-ft visibility margin (and a 6-s time margin).

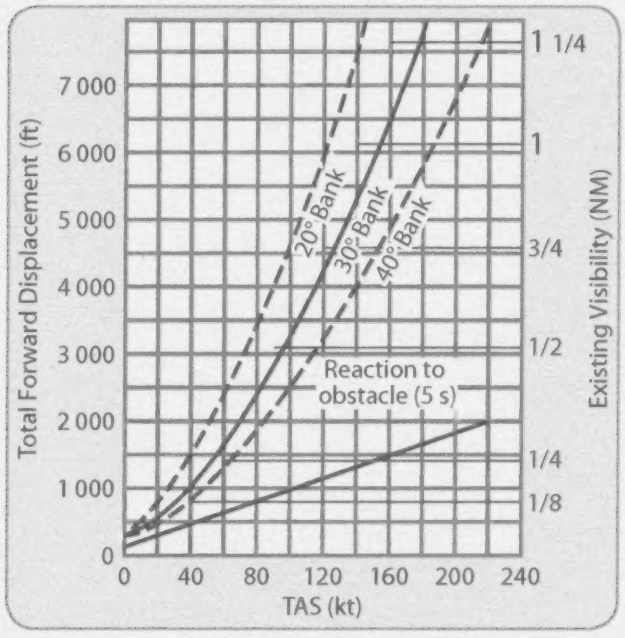


Figure 2

Figure 2 shows the theoretical relationship between existing visibility and maximum safe airspeed for various speeds and bank angles. It can easily be seen that pilots who operate in a higher speed region must give themselves a lot more manoeuvring room under conditions of poor visibility. For instance, at 180 kt (quite likely fixed-wing), the total displacement toward the obstacle during an evasive manoeuvre with a 30° bank turn is about 1 NM. The implication is that, at 180 kt, the pilot needs at least 1 ¼ NM visibility. When speed is reduced to 100 kt, forward displacement is about 2 300 ft and a visibility of ½ NM will give a reasonable margin of safety.

These figures are based on no-wind conditions. It speaks for itself that a headwind works for the pilot and a tailwind works against. It should also be noted—and this is the key point—that poorly-visible obstacles, such as wires, dead trees, and towers may increase the visibility requirement by a factor of 10 or more. We can easily see that blasting along at 100 kt may not be all that smart when visibility is down to ½ NM. The dotted lines in Figure 2 show the total forward displacement when bank angles of 20° and 40° are used. The only purpose of this article is to show that, ***theoretically*** at least, forward visibility is directly related to a ***maximum*** safe airspeed, as shown in Figure 3.

Visibility	Maximum Safe Airspeed
600 ft	Below 40 kt
1/8 NM	Below 50 kt
1 000 ft	Below 60 kt
1/4 NM	Below 75 kt
2 000 ft	Below 90 kt
1/2 NM	Below 115 kt
3/4 NM	Below 150 kt
1 NM	Below 175 kt

Figure 3

Maximum and theoretically are stressed, because the figures above do not take into consideration hard-to-see objects that could ruin your day. These figures don't tell you how to fly your aircraft when visibility is poor. Neither do they take into account the fact that your eyes are going to be in and around the cockpit from time to time, which means that when you look up and see the obstacle for the first time, you may be past the point of no return. They do, however, act as a reminder that smart pilots don't fly faster than they can see, perceive and react. △

Use of Non-Aircraft Parts in Critical Systems in Amateur-Built Aircraft

An aviation safety information letter from the Transportation Safety Board of Canada (TSB).

On July 20, 2005, an amateur-built VariEze departed Runway 12 at the Lethbridge, Alta., airport on a visual flight rules (VFR) flight to Airdrie, Alta. The aircraft was observed to be trailing smoke as it departed on the downwind leg for Runway 12, and one minute and twenty seconds after takeoff, the pilot advised the Lethbridge flight service station (FSS) that the aircraft was on fire. The pilot subsequently attempted to force-land in a grain field approximately five-eights of a mile to the northwest of the airport. After touchdown the aircraft nosed over, struck the shoulder of a secondary road, and came to rest inverted on the road. An intense post-impact fire ensued and the pilot, the sole occupant, sustained fatal injuries. (TSB Class 5 occurrence A05W0148.)

The aircraft had been modified shortly before the accident, with the installation of a turbocharged, liquid-cooled Rotax 914 UL-2 pusher engine (serial number: V9144874), which replaced the original Lycoming O-235 engine. This was reportedly the only VariEze flying at

the time with this engine configuration. Post-impact examination of the airframe and engine indicated the aircraft had sustained an intense, in-flight engine fire. This was consistent with witness observations. The short duration of the flight and degree of in-flight fire damage to the engine and cowlings indicated the fire was fuel-fed from within the engine compartment.

In addition to the engine installation being unique to this model of aircraft, the engine itself was also highly modified, with the addition of an intercooler on the induction system and higher compression cylinders and pistons. A major repair or alteration to an amateur-built aircraft requires re-licensing and issuance of a new airworthiness certificate and operating limitations. Although the original Special Airworthiness Certificate that was issued to the aircraft specified that no changes could be made without notifying the Federal Aviation Administration (FAA), the recent modifications had not been reported to the FAA.

A piece of detached, heat-damaged tubing, complete with clamp and remnants of a burned rubber hose, was recovered from an unburned area of the wreckage trail. The tubing was submitted to the TSB Engineering Branch to determine if it was a fuel system component (see Figure 1) and the mode of failure. Examination of the fracture surface of the fitting did not identify any signs of a progressive failure; however, the fracture surface displayed fire damage. As the tubing, clamp, and hose were recovered from an area of the wreckage trail that was not exposed to the post-impact fire, the fire damage likely occurred prior to impact (see Figure 2).

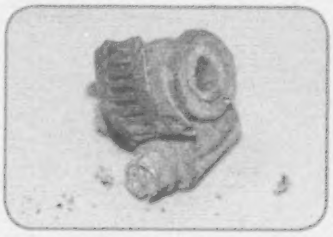


Figure 1: Heat-damaged tubing, hose and clamp recovered from the wreckage trail

Visual and dimensional comparison of the tube fragment indicated it was the inlet post of a NAVMAN fuel flow transducer. Information provided by NAVMAN revealed the fuel flow transducer was designed for marine applications, and not for use in aircraft. At present, there is no FAA or Transport Canada (TC) regulation that precludes the installation of non-aviation parts in critical systems in amateur-built aircraft.

The major portion of the fuel flow transducer was not recovered. Due to the extent of fire and impact damage, the precise location of the transducer was not determined. The engine fuel system utilized a fuel pressure regulator that bypassed surplus fuel back to the fuel tanks; therefore, the transducer would most likely have been mounted between the fuel pressure regulator and the carburetors within the engine compartment so as to accurately record the amount of fuel actually being consumed. The transducer was designed to be mounted on the suction side of a fuel pump, rather than on the pressure side. It was manufactured from a composite glass FORTRON material. It had a published maximum operating temperature of 50°C and a component failure temperature of 509°C. Fuel flow transducers used in aircraft applications are normally mounted within the engine compartment, and transducer housings are usually made of stainless steel. The engine compartment would see temperatures of several hundred degrees Celsius during normal operation, particularly near the turbo-charger, and if the transducer was mounted in the engine compartment, it could have been exposed to temperatures that exceeded its maximum designed environmental temperature range.

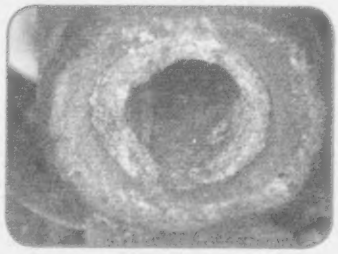


Figure 2: Close-up of heat-damaged fracture

The airframe and engine were fire damaged to the extent that no component testing or leak checks could be accomplished. While the occurrence is consistent with the aircraft having sustained a fuel-fed in-flight engine fire, the exact reason for the fire could not be determined.

There is a potential risk related to the use of non-aviation components in critical systems in amateur-built aircraft. Failure of a critical fuel system component, such as a non-aviation fuel flow transducer within an aircraft engine compartment, could result in a pressure-fed fuel leak which, if ignited, would generate an intense in-flight engine fire. Builders must consider the application, environmental exposure, and consequence of component failure when installing components that are not produced under a production certificate, a technical standard order (TSO) or a parts manufacturer approval on an amateur-built aircraft. While investigators were unable to directly link the origin of the in-flight fire to the marine fuel flow transducer in this case, there may be other situations where the use of non-aviation parts in critical systems present an on-going risk in the amateur-built aviation community.

Procedures in the event of in-flight engine fire in single-engine aircraft

The TSB issued a second safety information letter as a result of this occurrence. As noted above, the aircraft sustained an intense, in-flight engine fire. While the exact cause of the fire was not determined, the short duration of the flight and degree of in-flight fire damage to the engine and cowlings indicated the fire was fuel-fed from within the engine compartment.

Fuel was supplied to the engine through two electric boost pumps (one main pump and one auxiliary pump) and a fuel selector. The electric fuel pumps were capable of pumping fuel at rates in excess of 30 U.S. gallons per hour. Wreckage examination determined that the fuel selector handle was in the vertical position, which indicated it was selected to the auxiliary fuselage tank, and the fuel boost pump switches and magneto switches were in the ON positions at impact.

The standard emergency procedures in the event of an in-flight engine fire in a single-engine aircraft include placing the fuel selector and boost pump switches in the OFF positions, placing the magneto switches in the OFF positions, and performing an engine-out landing in the most suitable available area. If the fire does not extinguish quickly, a pilot may dive the aircraft in an effort to find an airspeed that will provide an incombustible fuel/air mixture. The *VariEze Owner's Manual* states that in the event of an in-flight fire one should: determine the cause—if electrical, all electrical power off; if fuel, fuel off and electrical power off—and execute a precautionary landing as soon as possible.

The accident occurred within approximately three minutes of takeoff. The fire appeared to have burned with increasing intensity from the time the aircraft was first observed to be trailing smoke to the time of impact. While the pilot was able to maintain control of the aircraft up to the point of touchdown in the grain field, there was no evidence that he had taken the immediate actions necessary to stem the flow of fuel to the engine. Allowing fuel to continue to pressure-feed into the engine bay significantly increased the intensity of the fire and likely precluded any possibility of self-extinguishment.

Although generally rare events, in-flight engine fires are serious and time-critical emergencies. In this occurrence, non-actioning of the emergency procedures necessary to stem the flow of pressure-fed fuel to the engine may have contributed to the severity of the accident. Vital immediate actions—including selecting the fuel boost pumps, fuel selector and magneto switches to the OFF positions—are necessary to reduce the intensity of, or extinguish, an in-flight engine fire as soon as possible. Pilots must be familiar with the procedures to handle uncommon but critical in-flight emergencies, such as engine fires, and must respond accordingly in order to reduce the risk of structural failure, post-impact fire damage, or loss of control and destruction of an aircraft with related occupant injuries or fatalities. △

In The Heat of the Moment—Firefighting and Helicopters

by Rob Freeman, Acting Program Manager, Rotorcraft Standard, Certification and Operational Standards, Standards, Civil Aviation, Transport Canada

The following Aviation Safety Alert comes courtesy of the United States Department of Agriculture (USDA) Forest Service. It makes for very interesting reading for a number of reasons; primarily because of the higher accident rate for helicopters used on firefighting tasks, but also because of how the helicopters were used when those accidents occurred. Surprisingly, almost three quarters of USDA Forest Service accidents that occurred between 1995 and 2005, involved external loads, and more than half involved water buckets.

You might argue that this is to be expected—after all, buckets and external loads are an integral part of firefighting, but some of the occurrences have been unusual. In one incident, the crew convinced the pilot that using the water bucket as a wrecking ball to knock down a dead tree was a good idea! He got away with it, but none of the bucket manufacturers have this listed as "other uses" in their marketing brochures. In contrast, snagging the longline has resulted in many serious or fatal accidents in Canada. Other incidents in this Aviation Safety Alert reflect alarming trends toward on-the-spot improvisation.

Of all the tasks you can perform in a helicopter, working on forest fires in particular can make a pilot feel like the central figure in an action movie—smoke, flames, noise, equipment, and crews deployed in and out of tough spots on short notice; even the possibility of evacuating towns at risk. Other operators' crews are watching. All eyes are on you. *"Here's the job. I know it's tough. Are you pilot enough to handle it?"* The pressure quickly mounts, and it takes maturity to remember where the lines are and not get sucked into the emotional vortex.

What's the lesson here? When you are assigned to forest fire duty, particularly if you are new to the business, you have to keep the adrenalin rush at bay. On a big fire, there is a sense of urgency that can overcome common sense, and as "The Pilot," you may be at the pointy end of a really bad

idea. Normally, the fire management folks are fully aware of the machine's capabilities, but that is not always the case. On a large fire, personnel unfamiliar with helicopter operations may be called in to cover, and a hurriedly appointed "supervisor" may suggest a task that is beyond your ability. You have to be ready to say no, when it is appropriate. Remember that you always have that option.

We have to assume that less-than-great ideas do not respect international borders, and that some of the activities listed in the USDA Forest Service Aviation Safety Alert may have found their way north. Obviously, using equipment for a purpose for which it is not designed should not be entertained. It puts you into the test pilot category with attendant high risk and no safety net or official authorization. It's all bad news from here.

If you are asked to try something out of the ordinary, for which you have not been trained, or is not contained in your operations manual standard operating procedures (SOPs), a call to the chief pilot or operations manager should be the first priority. Fires are tough enough assignments, without having to fly with crossed fingers too!

United States Department of Agriculture **Forest Service**

AVIATION SAFETY ALERT No. 2005-01(July 1, 2005)

Subject: *Helicopter External Load Operations, Safety and Risk Assessment*
Area of Concern: *Fire and Aviation Operations*
Distribution: *Fire and Aviation Personnel*

The most important part of any risk assessment is to identify the hazard(s) of a particular operation before taking action. In our firefighting discipline it can be challenging to decide which poses the greater hazard, when every option you consider contains potential for multiple ground and aerial incidents.

Recently a helicopter was supporting a fire with bucket drops. A burning snag on the fireline was causing concern with visible widow-makers, a steep slope, active burning, and exposure across a handline. Fire personnel, including helitack personnel and the IC were involved in a deliberate risk assessment process before electing to use the helicopter for additional mitigation. Previous water drops had been unsuccessful in extinguishing the burning snag. They subsequently elected to use the bucket as a wrecking ball against the tree and the pilot accepted their decision. Several personnel stated they had seen this done in several other geographic areas. After bumping the tree a few times enough widow-makers were dislodged that fallers felt safe in cutting the snag down. Finally, the mission was accomplished without injury to ground personnel or damage to the helicopter, crew and/or bucket.

However, analysis of earlier mishaps shows that we have not always been so lucky. Review of the last 10 years of accident history shows 26 helicopter accidents, of them 19 accidents (73%) occurred while operating with an external load, 14 occurred with buckets (54%).

For example, an AS316 in August 1998 snagged a bucket in trees, snapped the long line which then wrapped around the tailrotor and the pilot lost control of the aircraft. The pilot survived but the aircraft was a total loss.

A Bell 206 in August 2004 struck the main rotor blades in a tree top while attempting to helimop the base of a pine tree. While lowering the bucket along the tree trunk the pilot lost situational awareness and the main rotors struck the tree causing significant damage and down time.

In 2003 a contract pilot elected to use a longline for extraction of a parachute from a treetop. He later stated to the disciplinary Pilot Review Board that he had heard that smokejumpers often used helicopters for similar "retrieval" missions.

After reviewing several incidents of similar risk taking, the Board decided that the type of behavior being exhibited should not be tolerated. The pilot's card was removed until he had attended additional aviation safety training to increase his risk awareness.

Mitigation of risk for helicopter external loads

There is no existing regulation or policy that restricts the use of a helicopter bucket, or any other external load from being used to batter trees, but it's not a good idea. Just because the manual doesn't say that you can't, doesn't mean that it is acceptable or safe. Here are some "common sense" practices to apply to any external load when attempting to assess and/or mitigate risks.

- Use the equipment within the intended design application (i.e. to carry a load from point A to point B not as a wrecking ball or aerial grappling tool).
- Plan the pickup and delivery to be accomplished with the main rotors well above the top of the canopy.

- Landing areas and drop zones should be at least one and a half times the rotor diameter.
- Avoid confined area operations in gusty wind conditions. *(Ref. IHOG Chapter 6)*
- Keep buckets above the canopy line. Threading buckets down through trees accepts unnecessary risk.
- Helicopter mopping operations are not efficient and increase exposure to risk of damage to the helicopter and injury to the pilot.
- Match the aircraft and equipment to the mission after considering density altitude and weight and balance for "hot, high and heavy" conditions.
- Avoid being caught up in a "Can DO" attitude that leads you to any helicopter mission that requires a non-standard practice, or operation not required by the contract.
- Remember that over 70% of all Forest Service helicopter accidents have involved external load operations. When performing a risk assessment ask yourself, "what can go wrong here?"
- When given several options, generally choose to apply the most conservative approach at accomplishing the mission.

Ron Hanks
National Aviation Safety and Training Manager
U.S. Forest Service

Thank you to Ms. Barbara Hall, Regional Aviation Fire and Training Manager for the USDA Forest Service, who provided this USDA Forest Service Aviation Safety Alert and authorized its reproduction in the Aviation Safety Letter *(ASL).* △

Direct VFR Flight in Mountains Results in Another CFIT Accident

The pilot had been briefed visual meteorological conditions (VMC) existed in the mountain passes throughout his flight. He went direct, however, bringing into play some broken to overcast cloud layers hiding high mountain ridges.

On August 22, 2005, the pilot of a Cessna 180H and one passenger departed Springbank, Alta., at 11:06 Mountain Daylight Time (MDT), on a VFR flight to Boundary Bay, B.C. The aircraft was last recorded on ATC radar approximately 34 mi. southwest of Springbank, at 8 700 ft above sea level (ASL). The aircraft did not arrive in Boundary Bay, and there was no further contact with the flight. After an extensive search, the wreckage was found a week later at the 8 850-ft level on the east slope of Mount Burns in the Kananaskis region of Alberta. The aircraft was destroyed and both occupants sustained fatal injuries. This synopsis is based on the Transportation Safety Board of Canada (TSB) Final Report A05W0176.

The pilot had obtained a telephone weather briefing from the Edmonton flight information centre (FIC) at 07:38 MDT on the morning of the flight. The briefing indicated that VMC existed in the mountain passes between Alberta and British Columbia, and were expected to persist throughout the flight. The pilot filed a VFR flight plan, which included a direct routing from Springbank (CYBW) to Cranbrook, B.C. (CYXC), at 12 500 ft ASL.

The observed 11:00 weather at Springbank was as follows: light southerly winds, visibility 30 SM, few clouds at 4 000 ft above ground level (AGL) and 8 000 ft AGL, broken clouds at 24 000 ft AGL, temperature 15°C and dew point 6°C. The 11:00 weather at Cranbrook was as follows: calm winds, visibility 25 SM, few clouds at 13 000 ft AGL, overcast cloud at 22 000 ft AGL, temperature 14°C, and dew point 4°C.

The graphical area forecast (GFA) valid for six hours from 06:00 indicated that a weakening cold front was moving through the planned flight route. Broken cloud layers were expected between 9 000 ft and 18 000 ft, with isolated embedded altocumulus castellanus (ACC) giving visibilities more than 6 SM in light rain showers.

Environment Canada's analysis of conditions at the accident site indicated scattered to broken cumulus based at 6 000 ft with tops at 7 000 ft, and broken to overcast ACC based between 8 000 ft and 9 000 ft, with tops between 10 000 ft and 12 000 ft. Downflow and occasional moderate turbulence were predicted on the eastern slopes of the mountains in a southwesterly flow of up to 30 kt. Icing was not likely to have been present.

Generally, VMC existed at the lower levels in the mountain passes between Springbank and Cranbrook. The direct route flown by the pilot did not make use of these passes. Clouds were visible on the mountains to the southwest of Springbank when the pilot obtained a weather update from the FIC at 09:34.

Routine weather observations were recorded at two Alberta Forest Protection Service lookout towers: at Moose Mountain (18 NM north of the accident site) and at Junction Mountain (10 NM to the southeast). At the time of the only official observations, at 07:00, cloud covered both lookouts. The cloud had lifted by 11:00;

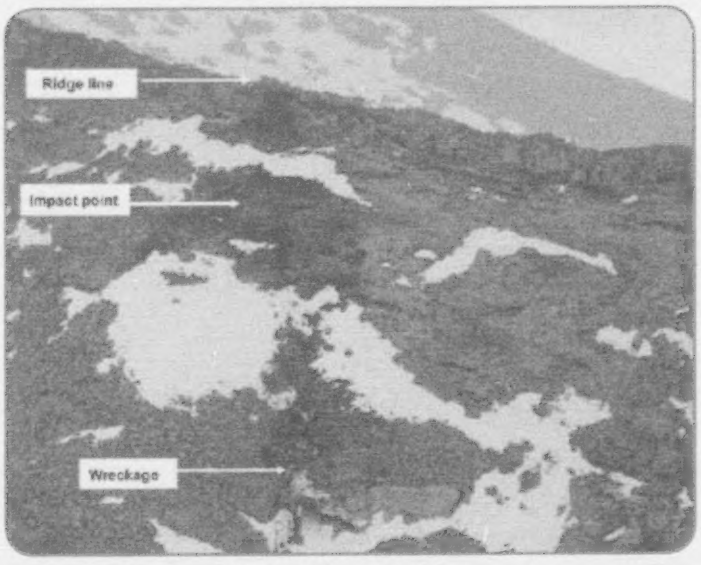
however, the higher mountain tops were still obscured by broken cloud at the time of the accident.

A pilot who flew from Fairmont, B.C., to Springbank at about 10:00 reported that cloud, which was topped at 10 000 ft, obscured the mountain tops on the east slopes of the Rocky Mountains.

ATC radar at the Calgary, Alta., NAV CANADA facility tracked the aircraft from shortly after takeoff until impact. After departure, the aircraft climbed to 8 300 ft on a track of 229° true (T) and gradually drifted down to 7 900 ft. The aircraft then commenced a climb and struck the mountain about two minutes later, at 11:27. The last recorded heading was 195°T, which was 17° left of the direct track from Springbank to Cranbrook. The aircraft's ground speed was recorded at between 80 kt and 120 kt during this period.

The aircraft contacted a near vertical cliff on the northeast face of a 9 000-ft ridge. The point of impact was about 50 ft from the top of the ridge, which was oriented southeast to northwest. Damage to the aircraft indicated that it was in straight and level flight at the time of impact. Most of the wreckage came to rest on a steep scree slope about 100 ft below the point of impact. The propeller was not found; however, examination of the engine crankshaft indicated that the engine was delivering some power at impact. Higher terrain existed within one mile on an extension of the aircraft's track past the ridge.

Search and rescue (SAR) was activated within one hour of the aircraft being declared overdue on its flight plan. Although the aircraft was found within 2 NM of the flight planned track, visual sighting of the wreckage was difficult due to the large search area involved, extremely rugged mountainous terrain, patchy snow cover, and break up of the aircraft from impact and fire. The pilot held a private pilot licence restricted to VFR and had accumulated about 1 500 flight hours, most of which were on the accident aircraft. The aircraft was certified, maintained, and equipped in accordance with existing regulations.



View of the accident site

The Flight Safety Foundation defines a controlled flight into terrain (CFIT) accident as, "one in which an airworthy aircraft, under the control of the crew, is flown unintentionally into terrain, obstacles, or water with no prior awareness on the part of the crew of the impending collision." This occurrence fits the definition of CFIT. Since it does not appear that significant, timely evasive manoeuvres were attempted to avoid impact with the mountain, it is likely that the pilot did not have visual contact with the mountain top. The flight profile obtained from ATC radar data and wreckage trail analysis suggests that, at the time of impact, the aircraft was under control and the engine was developing power. Since the aircraft struck the ridge at a relatively stable airspeed and heading (straight and level flight), it is likely that the pilot's vision was obscured by cloud immediately before impact. It is also possible that, in attempting to cross the ridge, the aircraft entered a downdraft and was unable to out-climb the terrain. Had the aircraft successfully crossed the 9 000-ft ridge, its track would have intercepted significantly higher terrain within one mile.

The pilot's weather briefing was correct, in that good VFR conditions existed in the mountain passes and at both ends of the first leg of the planned flight route from Springbank to Cranbrook. Although his briefing detailed existing and forecast weather in the passes, a direct route was filed and flown. Since there was broken cloud obscuring most of the high mountain tops along the east slopes of the mountains, weather conditions encountered by the aircraft at the altitude flown on the direct route would have been worse than those at the lower levels in the passes. The TSB concluded that the aircraft was likely flown into cloud, which prevented the pilot from seeing and avoiding the high mountainous terrain. △

RECENTLY RELEASED TSB REPORTS

The following summaries are extracted from Final Reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some excerpts from the analysis section may be included, where needed, to better understand the findings. We encourage our readers to read the complete reports on the TSB Web site. For more information, contact the TSB or visit their Web site at www.tsb.gc.ca. *—Ed.*

TSB Final Report A04A0099 —Collision with Terrain

On August 19, 2004, the pilots flew a Piper PA31-350 aircraft from Québec City, Que., to Saint John, N.B., on an IFR flight, with Fredericton, N.B., as their alternate airport. On arrival, they flew a radar-vectored, instrument landing system (ILS) approach in low-visibility conditions to Runway 23 at the Saint John airport. Radio contact was lost while the aircraft was on the approach, and a brief emergency locator transmitter (ELT) signal was heard at 22:34:30 Atlantic Daylight Time (ADT). The aircraft had crashed on final approach, and the two pilots sustained serious burn injuries in the ensuing post-crash fire.

Findings as to causes and contributing factors

1. Rather than conduct a missed approach when the approach became unstabilized, the crew continued in an attempt to land beyond the point where a missed approach could be executed, and the aircraft struck the terrain.
2. The crew members most likely experienced a loss of situational awareness during the latter stages of the approach and, consequently, were unable to fly the aircraft on the required track and descent profile for a safe transition to landing.
3. The crew members were permitted by regulation to conduct the approach in reported visibilities that were below the minimum advisory values published for the ILS approach, when they did not have procedures or training to operate as a crew in these conditions.

Finding as to risk

1. The crew did not have the benefit of up-to-date, in-flight weather conditions or knowledge that a Beech 1900 had just carried out a missed approach on which to base their approach decisions.

TSB Final Report A05P0103—Tail-Rotor Strike (External Load)—Loss of Control

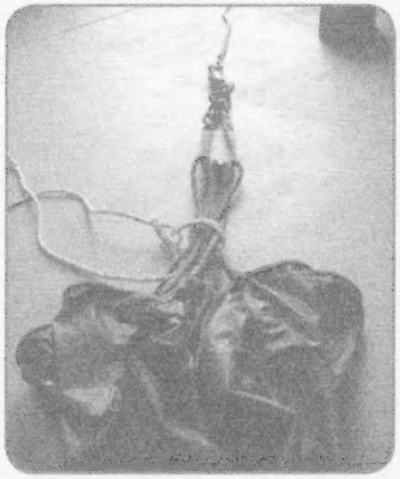
On May 7, 2005, a Messerschmitt-Bolkow-Blohm (MBB) BO 105 helicopter was carrying out external load operations near Bella Bella, B.C. It had completed 27 external loads and was returning to the Canadian Coast Guard Ship (CCGS) *Bartlett* from Dryad Point Lighthouse Station with an empty cargo bonnet. En route over the water, at an altitude of about 200 ft, the bonnet went above and behind the tail rotor, and the longline hung up on the back of the helicopter. The helicopter slowed, began to descend, turned right, and then crashed into the water. It sank immediately. The pilot was able to exit the sunken helicopter, but remained face down in the water. He was wearing an uninflated lifejacket. The pilot was rescued within three minutes and revived, but remained in critical condition for several days. The helicopter was found at a depth of 26 m on an ocean floor slope.

Bonnet

Finding as to causes and contributing factors

1. The rope used to snug the top of the bonnet most likely slid up the beckets, allowing the bonnet to open and fly into the flight path of the helicopter, carrying the longline with it. The longline came into contact

with the tail rotor and disabled it, rendering the helicopter uncontrollable.



Bonnet with sling attachment

Findings as to risk

1. Most helicopters are not designed or certified to accommodate vertical reference external load operations; however, these operations are very common and pilots fly in this higher-risk environment without proper safety-restraint devices.
2. It is likely that the pilot's unrestrained upper body moved around the cabin at impact. This increased the risk of injury and, in this case, the risk of drowning.
3. Even when properly secured, persons in either front seat risk hitting their heads on a fixture to which the liferaft is normally secured.
4. The colour of the pilot's helmet, life-vest cover and flight suit (grey and navy blue, respectively) made it difficult to see him in the ocean, increasing the risk of him not being found and rescued.

Other finding

1. The pilot's helmet protected his head from severe injury, allowing him to extricate himself from the sunken wreckage.

Safety action taken

Operator

On May 9, 2005, the operator issued a safety notice, restricting operations with empty or light external sling loads.

On May 25, 2005, the operator produced draft standard operating procedures (SOPs) for helicopter external load operations. These SOPs restrict the use of bonnets and caution pilots about light and unstable loads.

Transportation Safety Board of Canada (TSB)

On May 31, 2005, the TSB sent a Safety Information Letter to Transport Canada (TC), outlining the facts of this accident that showed that, despite the *Canadian Aviation Regulations* (CARs) and the previous Safety Advisory to TC (A010006), helicopter slinging operations without upper-body restraint continue.

In response to the above-noted Letter, TC provided the following:

- If the upper-body restraint equipment is used properly, and in accordance with the CARs, it will provide the protection intended by those requirements.
- It is the operations being conducted when these accidents occurred that led the pilots to loosen and/or remove elements of their restraint system. The existing CARs—subsection 605.27(3)—require at least one pilot to have the safety belt, which, as per the definition in CAR 101.01, includes the shoulder harness, fastened during flight time.
- If an operator discovers that installed equipment, a shoulder harness in this case, is unsuitable for "vertical reference helicopter sling operations," then TC has a well-established process in place for assessing and approving supplemental aircraft equipment.
- It is the responsibility of the industry to comply with the regulations, and, if warranted, apply for an approval of a configuration to meet the industry's operational needs. TC continues to welcome air operator and manufacturer initiatives to promote safe helicopter external load operations.
- Notwithstanding the current regulations and industry initiatives undertaken to date, TC has initiated the process to conduct research and development on the issue. A proposal has been submitted to the Civil Aviation Research and Development Committee to study crew restraint in vertical reference external load (VREL) operations. The objective is to develop a new restraint system and produce a safety education and promotion product on VREL operations.

On May 31, 2005, the TSB sent a Safety Advisory to TC, indicating that, during this investigation, a test revealed that, even when properly restrained, persons seated in either of the front seats are able to hit their heads on a fixture installed to hold a liferaft. The advisory suggested that TC may wish to modify the fixtures that hold the liferafts in the MBB BO 105 helicopters to remove the hazard, or limit use of the front seats to persons wearing

protective head gear. It also suggested that TC may wish to verify that other aircraft have not been modified to induce similar hazards.

In response to the above-noted Safety Advisory, TC provided the following:

- TC is undertaking a complete review of the applicable limited supplemental type certificate (LSTC) data package with regards to this occurrence. The data used to show compliance with section 27.561 of the U.S. *Federal Aviation Regulations* (FARs) are being reviewed and a determination will be made as to whether a design change is required. Although the review is not yet complete, it is possible that padding could be added to the fixture and a requirement be made that helmets are to be worn with this installation.

On June 1, 2005, the TSB sent a Safety Information Letter to TC, highlighting the facts of this accident and the continued operational practices of helicopters carrying empty or light slings. The letter pointed out that the TSB had made a recommendation (A93-12) to TC in 1993, that it coordinate the development and implementation of airworthiness standards and operational limitations for helicopter slinging equipment.

In response to the above-noted Letter, TC provided the following:

- Chapter 527.865 of the CARs addresses external loads for normal category helicopters and Chapter 529.865 of the CARs deals with transport category helicopters. These standards state the certification basis for helicopters equipped with external slinging capabilities (cargo hook). Helicopter slinging equipment is considered part of the load rather than the helicopter; therefore, it is not subjected to a Technical Standard Order (TSO) or supplemental type certificate (STC) approval process.
- The responsibility for ensuring safe slinging operations remains with the operator, and specific information on slinging and crew training is to be contained in the company operations manual. TC continues to welcome air operator and manufacturer initiatives to promote safe helicopter external load operations.
- Strategies to address helicopter rotor/sling strikes, and unsafe equipment and practices that lead to them, have included numerous articles in TC's safety publications, such as the former *Aviation Safety Vortex* newsletter.
- TC continues to be concerned with this area of operations. The Department has produced a new safety awareness video, titled *"Keep Your Eyes on the Hook! Helicopter External Load Operations—Ground Crew Safety."* The video's intended audience is ground crew and it addresses subjects such as occupational safety and health issues, briefings, protective equipment, communications and checking load and equipment such as straps and bonnets.

This article in the *Aviation Safety Letter* will further promote awareness of this hazardous practice.

TSB Final Report A05O0225 —Controlled Flight Into Terrain (CFIT)

On September 30, 2005, a Piper PA31 Navajo aircraft departed Runway 25 at Kashechewan, Ont., at approximately 21:30 Eastern Daylight Time (EDT) on a night VFR flight to Moosonee, Ont., 72 NM to the southeast. The captain was the pilot flying and was seated in the left seat. The aircraft became airborne approximately halfway down the runway, and the flight crew lost sight of the runway lights and any visual reference to the ground shortly after takeoff. The captain selected the landing gear up, and, at 200 ft above ground level (AGL), the first officer selected the flaps up, after which the captain set climb power. There was a slight drop in manifold pressure on the left engine, and the captain was readjusting the power when the aircraft struck the ground. The aircraft bounced into the air and came to rest approximately 300 m past the departure end of the runway. The aircraft was substantially damaged by impact forces. The six passengers and two pilots were not injured.

Findings as to causes and contributing factors

1. The flight crew did not follow the operator's standard operating procedures (SOPs) and ensure that a positive rate of climb was maintained after takeoff.

The aircraft developed an undetected sink rate and struck the ground.

2. During the night VFR departure into "black hole" conditions, the flight crew likely experienced a somatogravic illusion, giving them a false climb sensation. This likely contributed to the captain allowing the aircraft to descend into the ground.

Findings as to risk

1. The operator was using a maximum take-off weight (MTOW) of 6 840 lbs, when the actual MTOW was 6 730 lbs.
2. Tie-down rings and cargo restraints were not installed in the aircraft. The baggage that was loaded inside the aircraft was not secured, resulting in it being strewn about the rear of the cabin during the crash sequence.
3. A pre-flight passenger briefing was not conducted, and the passengers were unfamiliar with the operation of the aircraft exit.

Other findings

1. A scale was carried on board the aircraft but was not used. Because the flight crew estimated the baggage weight, the actual weight of the baggage was undetermined.
2. The total weight of the passengers, using self-reported weights, exceeded the standard weights by approximately 135 lbs.
3. The MTOW of the aircraft was incorrectly documented during two Transport Canada audits.

TSB Final Report A05P0269—In-Flight Break-Up

On November 3, 2005, a Boeing Vertol helicopter, model BV-107 II, was engaged in helicopter logging operations in the South Bentinck Arm, 20 NM from Bella Coola, B.C. At 13:30 Pacific Standard Time (PST), the helicopter was returning to the log pick-up site when one of the two pilots radioed that the helicopter was vibrating. Moments later, the crew made a second radio transmission indicating that the helicopter was behaving in an unusual manner, and that they would be returning to the maintenance base. Approximately 10 seconds later, the helicopter suffered an in-flight break-up and fell to the ground in several sections. Both crew members sustained fatal injuries.

Findings as to causes and contributing factors

1. The limit switches from the occurrence actuator did not meet the manufacturer's specification for switch arm travel. Since the switches cannot move in the vertical axis, it is likely that the greater arm travel distance prevented activation of the retract limit switch.
2. The retract limit switch's failure to activate caused the end fitting adapter to be driven into the face of the torsion bar, imposing a tensile load on the jack screw nut of over 1 300 lbs.
3. This high tensile load created a stress concentration within the 0.001-in. thread-root radius that was higher than the jack screw nut material endurance limit, which in turn caused the jack screw nut to fail.
4. The aft rotor blades became unstable following failure of the speed trim actuator jack screw nut. The aft rotor blades tilted forward into the helicopter fuselage, causing an in-flight break-up.

Findings as to risk

1. There are no indications to the pilots that the speed trim actuator has contacted the mechanical stop. Pilots could continue to unknowingly operate a speed trim actuator against the mechanical stop, eventually resulting in failure of the jack screw nut and a catastrophic airframe failure.
2. An internal thread-root radius of the jack screw nut was not specified in the production drawings. A larger thread-root radius would likely have a significant beneficial effect on fatigue life.
3. Once the speed trim actuator is installed and adjusted, no further periodic maintenance is required. Failure of either the retract or the extend limit switches would likely go undetected until the next overhaul interval.
4. Since the fatigue originated from the internal threads, fatigue cracking of the jack screw nut would not be apparent during visual inspections of the speed trim actuator. Internal fatigue cracks would continue to grow until failure occurred.
5. The arm of the switch is subject to wear, increasing the likelihood of a switch malfunction.

6. The operator could not provide source control documents for the parts replaced during the last overhaul of the speed trim actuator. Proper documentation aids in identifying the manufacturer and location of defective or unapproved components.

Other finding

1. The illustrated parts catalogue (IPC) for the speed trim actuator did not reflect the interchangeability of the USML117 and the 2LML82E switches.

Safety action taken

On November 23, 2005, the operator issued an inter-office memorandum to all Boeing 107 helicopter crews, detailing recurrent procedures to check the operation and serviceability of the speed trim actuator switches. As a result of this memorandum, one other speed trim actuator was identified as having a non-functional extend limit switch.

On November 23, 2005, Boeing Aerospace Support in Philadelphia issued Service Bulletin (SB) 107-67-1001, requesting that all operators of Model 107 helicopters (BV and KV) and 107 derivatives inspect and functionally test the longitudinal cyclic trim actuator limit switches. Boeing recommended that this test be accomplished before the next flight, and before each subsequent flight until further notice.

TSB Final Report A05O0257 —Runway Overrun

On November 15, 2005, a Gulfstream 100 was conducting an IFR flight from West Palm Beach, Fla., to Hamilton, Ont., with two pilots on board. The co-pilot was seated in the left seat and was the pilot flying. Approaching the destination, the flight was cleared for the instrument landing system (ILS) approach to Runway 12 at the Hamilton airport. The approach was at night in instrument meteorological conditions (IMC). At 400 ft to 500 ft above ground level (AGL), the flight crew saw the runway. At approximately 19:02 Eastern Standard Time (EST), the aircraft touched down on the wet runway with about 3 000 ft of runway remaining. The flight crew used all available braking systems to slow the aircraft. However, it ran off the end of the runway and travelled 122 ft downslope before it came to an abrupt stop when the nose wheel sheared off. The aircraft sustained substantial damage, but neither flight crew member was injured during the runway excursion. The emergency locator transmitter (ELT) activated, and the aircraft rescue and firefighting (ARFF) teams responded.

Aircraft being prepared to be towed back onto the runway

Findings as to causes and contributing factors

1. The pilot flying was slow to reduce the power to idle after flaring the aircraft for landing. Due to the excess airspeed and power, the aircraft floated, touching down with approximately 3 000 ft of runway remaining.
2. Although the available 3 000 ft of runway remaining exceeded the unfactored estimated ground roll of 2 200 ft, the aircraft was unable to stop. A touchdown speed higher than the landing reference speed (V_{ref}), slow deployment of the thrust reversers, standing water at the intersection of the runways, friction values at the runway ends that were at or below the Transport Canada runway maintenance planning level, and limited tire tread depth likely contributed to the runway excursion.
3. During the landing roll, the aircraft's tires hydroplaned, reducing the braking forces.

TSB Final Report A06W0002 —In-Flight Engine Fire

On January 5, 2006, a Douglas C-54G-DC (DC-4) departed from Norman Wells, N.W.T., at 17:49 Mountain Standard Time (MST) for a VFR flight to Yellowknife, N.W.T., with a crew of four and 2 000 lbs of cargo. While climbing through an altitude of approximately 3 500 ft above sea level (ASL), the crew experienced a failure of the No. 2 engine and a nacelle fire. The crew carried out the engine fire checklist, which included discharging the fire bottles and feathering the No. 2 propeller. The fire continued unabated. During this period, an uncommanded feathering of the No. 1 propeller and an uncommanded extension of the main landing gear occurred. The crew planned for an emergency off-field landing, but during the descent to the landing area, the fuel selector was turned off as part of the engine securing checklist, and the fire self-extinguished. A decision was made to return to the Norman Wells airport where a successful two-engine landing was completed at 18:04 MST. The aircraft sustained substantial fire damage, but there were no injuries to the four crew members on board.

Findings as to causes and contributing factors

1. Airworthiness Directive (AD) 48-12-01 mandates the replacement of the potentially hazardous fuel line, but the line had not been replaced on this aircraft.
2. A fuel leak from the main fuel inlet line in the engine compartment of this cargo DC-4 caused an in-flight fire that spread into the nacelle and wing.
3. The fuel-fed fire burned for an extended period of time because turning the fuel selector off is not required as part of the primary engine fire checklist.

Safety action taken

The Transportation Safety Board of Canada (TSB) issued two Aviation Safety Information Letters to Transport Canada (TC), addressing the following concerns in this occurrence:

- Aviation Safety Information Letter A060003-1 (A06W0002)—*Emergency Checklist—Engine Fire Procedure for Douglas C54G-DC Aircraft*, was sent to TC on February 23, 2006. This Letter highlighted the concern regarding the checklist timing for the fuel selector valve shutoff.

The operator has amended the engine fire checklist and the standard operating procedures (SOPs) for engine fire in the air, with the addition of "fuel selectors off" immediately after "mixtures to idle cut off."

- Aviation Safety Information Letter A060005-1 (A06W0002)—*Fuel Line Installation Configuration and Maintenance*, was sent to TC on March 2, 2006. This Letter addressed the concern regarding the applicability of AD 48-12-01 to C-54G-DC cargo aircraft.

On June 6, 2006, TC sent a response regarding Aviation Safety Information Letter A060005-1 (A06W0002) to the TSB. TC indicated that it had contacted the only operator of this aircraft type in Canada to determine if AD 48-12-01 had been incorporated on its aircraft. Two of its four aircraft were found not in compliance with the subject AD, and the company initiated the necessary steps to correct this. △

MAINTENANCE AND CERTIFICATION

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Inspection Levels Part 1: How Closely Should We Look?

by John Tasseron, Civil Aviation Safety Inspector, Aircraft Evaluation, Standards, Civil Aviation, Transport Canada

This is the first of three articles on the topic of inspection levels.

Most of the inspection tasks called up in a large aircraft maintenance schedule are performed with nothing more than adequate lighting and a bare eyeball. These tasks provide instructions on what to look at and how closely the identified item should be looked at (the level of inspection). Maintenance schedule builders for large aircraft rely on the Air Transport Association of America (ATA) for standards that categorize the levels to which items may be inspected. The same cannot be said for maintenance schedules designed for smaller aircraft. Let's look at some of the ways in which the problem of defining the level of inspection for a task is handled, so that we can determine whether our interpretation of what is expected meets the requirements.

For large transport aircraft, the term most commonly used, by far, for defining the level of inspection required is that of general visual inspection (GVI). Since, after several amendments, the definition for this term has become a long one, it has purposely been formatted (in this article, and not by ATA) so that it can be separated into a set of requirements as follows:

- "A visual examination of an interior or exterior area, installation, or assembly to detect obvious damage, failure or irregularity.
- This level of inspection is made from within touching distance, unless otherwise specified.
- A mirror may be necessary to enhance visual access to all exposed surfaces in the inspection area.
- This level of inspection is made under normally available lighting conditions, such as daylight, hangar lighting, flashlight, or drop-light, and may require removal or opening of access panels or doors.
- Stands, ladders, or platforms may be required to gain proximity to the area being checked."

Clearly, it starts by stating that the eyeball will be used as the inspection instrument, and that the inspection can apply to areas, installations, or assemblies on the outside

or the inside of an aircraft. Note that this includes the so-called "zones" identified in maintenance schedules for aircraft that have been subjected to "zonal analysis" under a maintenance review board process (another ATA standard). The fact that the inspection must be made within touching-distance of the surface being inspected ties in with the need to find obvious damage (inspections done beyond arms-length will not be adequate), but also means that the security of installations or assemblies can be verified by physically grasping the parts. The part about "unless otherwise specified" is a slippery slope that appears when the "otherwise" becomes the subject of discussions relating to other inspection level definitions. Next, we are made aware of the need to enhance visual access by use of a mirror, if necessary. This means that the GVI also applies to the back surfaces of items that are included in the area being inspected, and that the difficulties associated with the use of mirrors must be compensated for. The explanation of the kinds of lighting that may be necessary ties in directly with the problems of inspecting areas to which access must be gained through the removal of panels or opening of doors. It is implied that the drawbacks of restricted access will need to be offset by introducing appropriate levels of lighting. Finally, the need for stands, ladders or platforms is emphasized, although this seems superfluous, given that without these items, "touching distance" may not be obtainable.

The problem is to convey a clear, consistent understanding of the GVI requirements through the use of a definition that will be easily remembered when needed. In this case, the most important thing to remember is that the work needs to be done at arms-length, and all surfaces need to be inspected. A more concise way of stating the requirements may help. Therefore, for ease of recollection, an alternative definition may be, "a visual examination of an interior or exterior area, installation, or assembly, made from within touching distance, to detect obvious damage, failure, or irregularity. This inspection level may require the removal or opening of access panels or doors, and is made under adequate lighting conditions (daylight, hangar lighting, flashlight, drop-light)."

In smaller aircraft inspection schedules, the intent of GVIs may be indicated by use of the word "inspect" or "check," and no definition. It is assumed that the technician performing the work will know what to look for. If there is a concern about consistency, sometimes the wording of the task will include details such as, "pay particular attention to..." This approach attempts to assign levels of inspection through additional instruction, rather than through the use of terms and their definitions. The danger with this is that the inspector may concentrate more on the item so identified, instead of equally-important adjacent items. To obtain a consistent level of inspection in the absence of clear instructions demands additional training or supervision, perhaps backed up by a policy shared with those doing the inspections. As a guide, it may be useful to know that the word "inspect" is often used to differentiate from the word "check." Inspection implies an activity that encompasses a number of different requirements (inspection level, scope, access, lighting, verification of security, etc.), while the word "check" frequently concerns visual verification of a small detail only. How these words are used, therefore, becomes important. ATA has the preferred approach—provide a term and a definition to maintain consistency. Anyone faced with the problem of defining the content of an inspection schedule for a smaller aircraft may use terms and definitions that are already established by the industry to ensure clarity and consistency. Where unique requirements exist, new terms and definitions may have to be developed. If this is the case, ensure that the new terms do not accidentally use established definitions, and vice versa (especially if they are ATA terms and definitions)! △

Inspecting Airplanes on the Ramp—The Role of the Canada Border Services Agency (CBSA)

by the Technical and National Programs Division, Standards, Civil Aviation, Transport Canada

Have you ever noticed people, other than your co-workers, around an aircraft, looking in wheel wells and opening all the access panels, and wondered who they were? Did you get very protective of your company's property all of a sudden? You were probably surprised to find these individuals examining an airplane you are responsible for. You may be the aircraft maintenance engineer (AME) who has to attest for the condition of the airplane, and you certainly should be concerned that others have access to it. In this respect, you are putting your own professional reputation on the line, as well as that of the approved maintenance organization (AMO) for which you work. After all, company procedures and policies in the maintenance control manual (MCM) or maintenance policy manual (MPM) have to be followed, and it's your job to ensure that they are.

The Canadian aviation industry is recognized for a high level of maintenance standards. A major contributor to this is the requirement to have an approved maintenance program and a professional calibre of people performing the maintenance. Consequently, when a maintenance crew encounters an unknown person around the aircraft, it is their responsibility to find out who the individual is, and under what authority they are there.

More than likely, the individual is legitimate and will have official credentials to explain their presence. Authorized personnel, such as Border Services Officers (BSO) (formerly called Customs Officers), will be able to show you their official credentials. In order to perform their job effectively, they must have unfettered access to the aircraft. To explain this, it is important to remember that they are working with the best interest of the Canadian public in mind. Their role is to look for hidden narcotics and other such contraband, or smuggled goods that can also jeopardize the safety of the aircraft, due to where they are hidden. Their inspection activities are very much a joint effort with the aviation industry to enhance border security, combat organized crime and terrorism, increase awareness of customs-compliance issues, and help detect and prevent contraband smuggling.

A closer look at their inspection practices highlights how this is accomplished. The CBSA uses a variety of technologies and initiatives to detect contraband and prohibited or restricted goods. They share information from their independent inspections and encourage the industry to do the same. Often, AMEs are faced with a situation where contraband is discovered and is turned over to BSOs. Conversely, BSOs may encounter aircraft components in need of adjustment or repair, and can pass this information along to the maintenance personnel.

Any aircraft on an inbound flight from a foreign departure point may be subject to inspection by customs. The CBSA selects aircraft for inspection based on a risk-management approach, focussing on flights that represent the highest level of risk. When BSOs are going to perform an inspection, they make every effort to notify the aircraft operator in advance, through its dispatch centre. When they perform a ramp inspection, they open exterior access panels that have "quick-release" style fasteners or interior panels with quick-release or screw fasteners. Should the officers wish to open other panels, they are instructed to seek the assistance of an AME. Upon the completion of the BSOs' inspection, the team leader documents their actions, listing any panels that were removed for access, and all areas that were inspected. The inspection report is left with the airline representative or, if no one is available, in the flight deck. With this information available, maintenance staff can verify that everything has been properly secured, or they can reopen the listed panels to look inside for themselves, and close them again for personal satisfaction that there are no mechanical infringements and the maintenance documentation requirements have been met. If an airline or their maintenance organization has concerns about an inspection, they should contact the local CBSA airport office to address them in a timely manner.

CBSA inspectors play a vital role on behalf of the Canadian public. Their officers are well trained and make every effort to work in conjunction with the airlines to ensure their activities do not jeopardize safety.

Occasionally, CBSA activities may cause delays—but not always. In some cases, things such as short turn around times, gate changes, late arrivals, and bad weather can mean it takes them a bit longer than everyone would prefer. Often, BSOs encounter problems in the inspection process, or they actually find something that wasn't supposed to be there. A delay is unfortunate, but they still require time to do their job properly and cautiously.

The CBSA has an important job to perform. There is no argument that their work is valuable, and that their presence on the ramp is a valid element in airline operations. However, in most cases, there is no consideration or leeway in the dispatch process provided to the CBSA to account for this unscheduled ramp activity. That means that, to a certain extent, the CBSA relies on co-operation with the airline to get the aircraft for their inspection, even though they have legislated authority in that respect.

Over the past few years, members of the various airlines, associated maintenance organizations, and the CBSA have been working together to develop standardized procedures for alerting the airlines of a pending inspection, the inspection process, and the paperwork that provides notification of the work and any panels disturbed. This has been a joint effort with complete buy-in by all interested parties. Transport Canada (TC) was involved as a key partner to ensure that the aviation regulations were taken into consideration, and that overall safety was not compromised. The combined process of aircraft inspections promotes "watching together" and "working together" concepts for all parties, and heightens awareness of the intricate systems and co-ordinated efforts required to get all things done, while limiting inconvenience for the average traveller.

On a regular basis, the CBSA discovers and confiscates drugs, arms shipments and contraband commodities. Their activities not only contribute to making Canada safer, but they also enhance aviation safety. They work proactively, at all times of the day and night, to perform their duties. Their work habits parallel those of the AME. So the next time you see a CBSA officer around your aircraft, work with them so they can do their jobs with minimal disruption. To learn more about the CBSA, visit www.cbsa-asfc.gc.ca. △

Two Cases of Reversed Flight Controls

by Patrick Kessler, Civil Aviation Safety Inspector, System Safety, Quebec Region, Civil Aviation, Transport Canada

In Aviation Safety Letter *(ASL) 1/2007, we referred to two aviation occurrences involving reversed flight controls. The System Safety Office in the Quebec Region studied these two occurrences. Below is an abbreviated and slightly reworded version of the two Transportation Safety Board of Canada (TSB) occurrence reports.*

Incorrect assembly of the aileron control system on a Cessna 172L

TSB Occurrence Report No. A00Q0043

Summary

The pilot owner of the Cessna 172, was making a visual flight rules (VFR) flight. The aircraft was carrying four persons. When the aircraft was at an altitude of 5 500 ft above seal level (ASL), the right-hand aileron yoke assembly came apart, and the pilot lost lateral control. He immediately declared an emergency on the 121.5 MHz frequency and was guided by the control centre to an airport, where emergency services were standing by. The elevator was functioning normally, but the pilot used it as little as possible for fear that the flight controls might jam completely. He successfully landed at Maniwaki, Que., without incident. No one was injured.

Background

On April 7, 2000, after the annual inspection of his aircraft, the pilot left the airport at about 16:45 Eastern Daylight Time (EDT)[1]. When the aircraft was 13 NM from the airport, at an altitude of 2 700 ft, the pilot noticed that the aileron control was no longer responding. Using the elevator, its trim tab, and the rudder, the pilot managed to turn back and set the aircraft down on the runway. The landing proceeded without incident, and the pilot did not declare an emergency.

When the pilot arrived at the hangar, the employees had all left the premises except for the maintenance manager. The maintenance manager checked the malfunction and found that the right-hand aileron yoke assembly had come apart and that some parts had fallen to the floor of the aircraft. The pilot's lack of a night rating put additional pressure on the maintenance manager, who rushed to complete the work before it began to turn dark.

He put the universal joint back in place, checked the operation again, and returned the aircraft to service without making any entries in the technical log or asking another person to perform an independent inspection.

The pilot took off again at about 18:25, and the flight proceeded without incident to the airport.

Four days later, the pilot took off again, and the right-hand aileron yoke assembly came apart again. The aileron and the elevator mechanisms are linked; the elevator responded normally, but the left aileron had a tendency to ride up and destabilize the aircraft. For that reason, the pilot used the elevator as little as possible, employing the elevator trim tab and the rudder instead. He landed at Maniwaki, where emergency services were standing by.

An apprentice technician had taken part in the installation of the aileron control system, and the maintenance manager had checked the work.

The work on the yoke involved rotating two identical parts from one side of the flight control to the other. The two mechanisms were similar, but access to the right side was restricted by the presence of the radio equipment and map compartment.

In the first occurrence, the work was simple enough for the maintenance manager to entrust to an apprentice technician with only one year's experience, without constant supervision. The apprentice technician was, however, supervised by an experienced apprentice technician.

During the annual inspection, the maintenance manager had suggested to the aircraft's owner that, for economic reasons, the universal joints be rotated instead of just replacing the left joint.

The work involved sliding the universal joint (part number [P/N] 0411257) into the sprocket (P/N 0511785-1), then pushing the shaft (P/N 0511788-1) into place and aligning it to install the bolt. The bolt would thus hold all the parts together.

In the second occurrence, the maintenance manager had trouble aligning and inserting the universal joint in the sprocket. To ensure the integrity of the assembly, the manufacturer had added a note specifying that washers (P/N AN960-816L) were to be installed on the shaft to limit the distance between the shaft and the bearing (P/N S1004-43A) to 0.005 in. (See Figure 1: Aileron control system.) The Cessna 172 maintenance manual contains no specific instructions for removing and installing the universal joints. The manual describes, rather, the procedure for removing and installing the control as a whole.

[1] All times are EDT (Coordinated Universal Time [UTC] minus four hours).

For a better view of the right-hand installation, the technician could have accessed all the parts by removing the map compartment, but he did not do so. The technician therefore had to work by feel in a more confined space. The universal joint was held in place by the pressure exerted by the nut, even though the nut was not in the right place.

Consequently, the abnormality could not be detected in the ground test of the controls. Removing the map compartment would have simplified the access and would have helped to visually confirm the incorrect assembly. The time required to remove and replace the map compartment was a determining factor in this maintenance operation. The distance between the shaft and the bearing was nearly 0.500 in., whereas it should have been 0.005 in. Even an inspection by touch would have been able to detect this abnormality.

In both occurrences, the work of rotating the universal joints was not recorded in the aircraft journey log or in the technical logs.

The pilot was present during the inspection of his aircraft in both occurrences. He remained in the hangar throughout the work and knew that the two universal joints had undergone maintenance work. Under existing regulations, he could have been asked to take part in the independent inspection following the maintenance work, but he was not. He did, however, perform a pre-flight check, and all the flight systems were functioning normally.

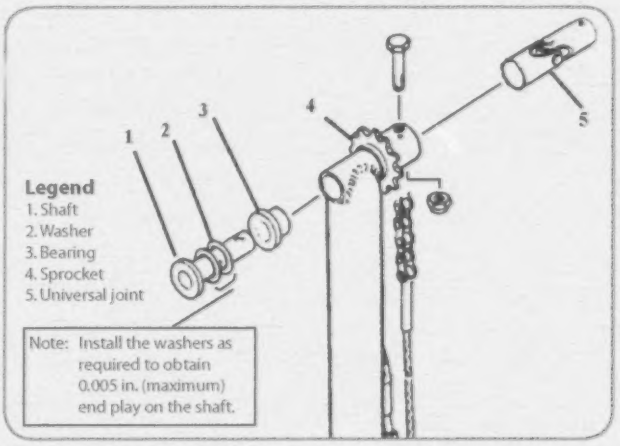


Figure 1: Aileron control system

Loss of control of a PA28-140 on takeoff

TSB occurrence report No. A01Q0009

Summary

A Piper Cherokee PA28-140, with two pilots on board, took off on a VFR flight. During climbout, about 25 ft above ground level (AGL), the aircraft rolled to the left. The pilot flying, who was also the owner of the aircraft, applied right aileron to compensate for the turn, but the aircraft continued to turn left. The other pilot also tried to straighten the aircraft by applying right aileron until the ailerons jammed in the full right position. The aircraft flew over a highway, and the left wing tip struck a snowbank on the side of the highway. The left wing separated at the fuel tank, and the aircraft came to rest in a field on the other side of the highway. The two pilots evacuated the aircraft and were taken to hospital for minor injuries. There was no fire.

Background

Since he had not flown in just over three months, the pilot flying asked a more experienced pilot to accompany him and supervise the flight. The purpose of the flight was to allow the pilot flying to confirm that his aircraft was operating correctly. The weather at the airport was suitable for VFR flight, and the surface winds were calm.

Preliminary examination of the aircraft by the investigator at the airport revealed that the bell cranks were installed backwards. The left wing had separated at the fuel tank, and one could clearly see that the bell cranks were not installed properly. By moving the ailerons from outside the aircraft, it was confirmed that the flight controls moved in the opposite direction.

The checklist used by the pilot provided three opportunities to confirm that the ailerons were functioning properly: the walk-around check, the before-start check, and the before-takeoff check. The pilot had to ensure that the flight controls were operating properly by confirming that the deflection of the control surfaces matched the deflection of the flight controls. The flight controls were reportedly checked during the walk-around check, the engine warm-up, and again during the before-takeoff check.

During these three checks, the two pilots ensured that the flight controls moved freely, but they did not pay particular attention to the directional deflection of the control surfaces. The checklist used by the pilot was the one he used during his pilot training. That checklist indicates that the flight controls must move freely, while the detailed checklist in the manufacturer's flight manual indicates that the flight control surfaces must be checked for proper deflection.

During the annual inspection, the aircraft maintenance engineer (AME) found that the aileron bell crank brackets were cracked and needed to be replaced.

The aircraft owner asked that his aircraft be repaired before the maintenance company closed for the Christmas

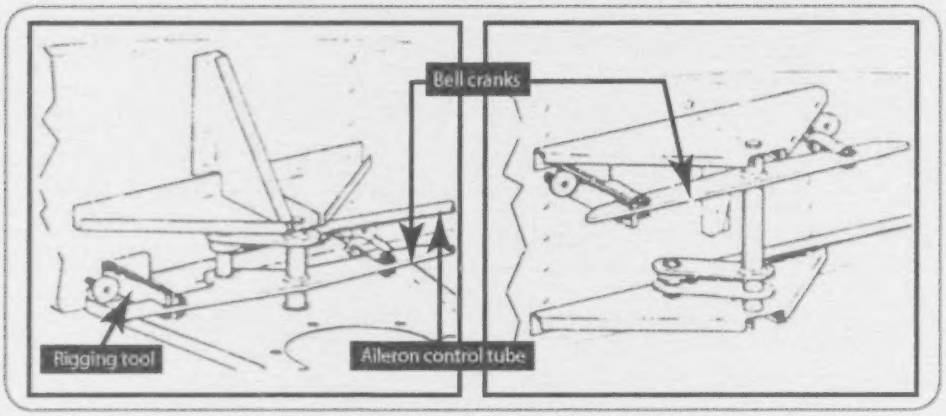


Figure 2: Aileron bell cranks on the Piper PA28-140

break. The parts were ordered, and the replacement work began on December 20, 2000. The maintenance company was short one AME and had another aircraft to fix before closing, so the replacement work was completed in a hurry on Friday, December 22, 2000.

This task involved removing the two fuel tanks to access the bell crank bracket mounting rivets. The work was laborious because the numerous fuel tank fastening screws were extremely rusted and hard to remove. The work took much longer than usual.

The task consisted of releasing the tension on the aileron cables in order to move the bell cranks into the wing without having to remove them from the aircraft. But because the bell cranks were so greasy, the AME decided to remove them to clean and inspect them.

The two bell cranks were not marked with a part number for identification. It would have been necessary to use the manufacturer's manual or parts manual for a diagram of the bell cranks installation, but this was not done. It was not the first time this task had been done in recent months; the AME had performed this task a few times during the past year.

Most aircraft maintenance shops use a microfiche reader for aircraft maintenance. As a result, the AME must either read the microfiche and memorize the procedure, or go back and forth repeatedly to the reader. Some readers have a feature allowing the microfiches to be printed out; this particular reader did not have a print feature. Consequently, the AME elected to perform the work from memory instead of using the microfiches. As a result, he interchanged the bell cranks when reinstalling them, thereby reversing the aileron controls.

The bell cranks were removed from the wing during reassembly, contrary to normal procedures. Therefore, an additional check—"Installation of aileron bell crank assembly," mentioned in section 5.11 of the maintenance manual—was required. Section 5.11(d) also indicates that aileron deflection must be verified using the method specified in section 5.12. If this check had been performed according to the procedures, the AME would have noticed that the bell cranks were installed backwards.

The AME who performed the work was the company president and director of maintenance. An independent AME recorded the independent inspection in the aircraft technical log; he did not notice that the controls were reversed.

Tests were done on the same model of aircraft to determine whether there was an obvious difference between the two installations that would have alerted an AME performing this maintenance task. Both bell cranks were removed and mounted backwards as on the occurrence aircraft. The installation appeared correct at first glance, except that the fasteners for the aileron control rod, located toward the wing tip, put the rod out of alignment and caused a very slight rubbing against the skin of the trailing portion of the wing. The rubbing was not audible, and there was nothing wrong with the operation of the ailerons, except that the aileron directional deflection was reversed and the range of deflection was changed.

According to the aircraft maintenance manual, the ailerons must be adjusted to deflect upward 30° and downward 15°, with a tolerance of 2°. Bell crank travel is limited by stops on either side. Before the bell cranks were mounted backwards, the aileron deflection during this test was within the limits prescribed by the manufacturer. After the bell cranks were mounted backwards, the left bell crank did not come into contact with the forward stop, and the aileron deflection was not within the prescribed range. The right aileron could deflect upward 18° and downward 14°, and the left aileron could deflect upward 25° and downward 14°. △

ACCIDENT SYNOPSES

Note: All aviation accidents are investigated by the Transportation Safety Board of Canada (TSB). Each occurrence is assigned a level, from 1 to 5, which indicates the depth of investigation. Class 5 investigations consist of data collection pertaining to occurrences that do not meet the criteria of classes 1 through 4, and will be recorded for possible safety analysis, statistical reporting, or archival purposes. The narratives below, which occurred between May 1, 2007, and July 31, 2007, are all "Class 5," and are unlikely to be followed by a TSB Final Report.

— On May 1, 2007, a Cessna 180J was landing at Stanley Mission, Sask., on a flight from Wollaston Lake, Sask. Upon landing at the community ice strip, the ski-equipped aircraft encountered several re-frozen ice ridges left by snowmobile activity the previous day. No injuries were reported, but the aircraft sustained damage in the area of the right main landing gear attachment. *TSB File A07C0072.*

— On May 2, 2007, a Cessna 120 was on a local flight from a private grass strip on Amherst Island, Ont. Approximately five minutes after takeoff, the engine, a Teledyne Continental C-85-12F, lost power and subsequently stopped. A forced landing was carried out. The airplane landed in rough ground short of the intended field and sustained damage to the landing gear and wing tip. The pilot received minor injuries. Water was found in the fuel tank. *TSB File A07O0109.*

— On May 4, 2007, a Canadian Ultralight Chinook Plus 2 was on a flight from Wiarton, Ont., to a nearby private strip after refuelling at Wiarton. Shortly after departing Wiarton, the engine, an HKS Japan reciprocating engine, sputtered and stopped. A forced landing was attempted, but the airplane landed short of the intended field and struck a stone fence, resulting in landing gear and lower fuselage damage. The pilot was uninjured; the passenger received minor injury. The aircraft has reportedly had previous fuel system problems. *TSB File A07O0112.*

— On May 7, 2007, a Bellanca 8KCAB Citabria was landing on Runway 18 at the Owen Sound/Billy Bishop, Ont., airport. During landing, a crosswind gust from the left caused a loss of directional control, resulting in the airplane departing the left side of the runway. The right main gear collapsed; the right wing tip scraped; and there was a prop strike. The pilot was the sole occupant and was uninjured. *TSB File A07O0113.*

— On May 8, 2007, a DHC-2 Mk. 1 amphibious Beaver was taxiing for takeoff at Crawfish Bay, B.C., for a flight to Fort Langley, B.C., when the front of the floats dug in, and the aircraft flipped over and sank upside down in deep water. The three occupants evacuated the aircraft and swam to shore. They were uninjured. *TSB File A07P0136.*

— On May 9, 2007, an amphibious Seawind 2000 aircraft was conducting touch-and-goes on Lac des Deux Montagnes, Que. During the take-off run, the aircraft started porpoising, before flipping over. The pilot evacuated the aircraft and sustained minor injuries. The aircraft sustained major damage. *TSB File A07Q0076.*

— On May 13, 2007, an Aeronca 11CC took off from Montréal/Aéroparc Île Perrot, Que., bound for Montréal/Les Cèdres, Que., with a student-pilot and instructor on board. The student-pilot was at the controls during landing on Runway 07. The aircraft made a hard landing and bounced. During the landing run, the aircraft turned off to the right, despite use of the rudder pedal to correct the course. The instructor, seated on the right, decided to go around and return to land on Runway 25. During the landing, the aircraft turned off to the right again. The instructor could not control the aircraft's looping. (The right-hand seat does not have a brake.) The tail ran into a ditch that runs along the south side of the runway. The tail structure sustained major damage. Examination of the aircraft revealed that the steering arm that transmits direction to the tail wheel was cracked. Part of it was found at the location where the first landing occurred. It was sent to the TSB laboratory for examination. *TSB File A07Q0078.*

— On May 15, 2007, a Six-Chuter powered parachute was manoeuvring at 100 ft to 150 ft above ground level (AGL) near Goodsoil, Sask., in preparation for landing, when the parachute canopy twisted and partially collapsed. The pilot was unable to reinflate the canopy and a loss of control occurred, followed by a collision with terrain. The pilot was fatally injured and the aircraft sustained substantial damage. The canopy was an Air Extreme PW-500. The aircraft engine type was Rotax 503 series, two-stroke. *TSB File A07C0081.*

— On May 24, 2007, a Cessna 152 was taxiing to the holding area of Runway 29 at the Mascouche, Que., airport. The pilot did not notice the parked fuel truck and hit it with the left wing. The two occupants of the aircraft were not injured. The aircraft sustained major damage to the left wing. *TSB File A07Q0082.*

— On May 29, 2007, a de Havilland DHC-6-100 had departed Yellowknife, N.W.T., for the Lac de Gras road camp, located approximately 12 NM southeast

of Diavik, N.W.T. The aircraft landed on an esker at what the flight crew thought was the camp. They were informed that the intended camp was on the other side of the lake. The flight crew shortened the takeoff, as there was a snowbank at the left end of the proposed take-off area. During the take-off roll the aircraft became airborne prematurely and used up more distance than anticipated in order to accelerate out of ground effect. This put the aircraft in a position where the flight crew needed to manoeuvre to the right to avoid the snowbank, and in doing so, the right wing tip struck a gravel embankment. An abnormal amount of left aileron was required for level flight, and the flight crew decided to divert to Diavik. After landing, the flight crew observed buckling and wrinkling damage to the right outboard hanger and aileron. *TSB File A07W0096.*

— On June 3, 2007, a Bell 206B helicopter departed Baker Lake, Nun., for a mining camp situated 43 mi. to the north. Prior to departure, the pilot checked the weather conditions at Baker Lake, which were reported as VFR. Approximately 5 km from the camp, the pilot encountered deteriorating weather conditions with reduced visibility. The helicopter was approximately 2 km away from a survival camp, and while manoeuvring towards the camp, the pilot entered an area of whiteout and lost visual reference with the ground. The helicopter struck a snow-covered frozen lake surface at very low airspeed (less than 20 kt) and rolled over onto its left side. The main rotor head separated from the helicopter. The pilot was uninjured; however, the helicopter was severely damaged. *TSB File A07C0094.*

— On June 16, 2007, a Piper PA11-SX floatplane was being taxied, reportedly without any intention for flight. During one run down the lake, the airplane was apparently caught by a gust of wind, resulting in unintended flight. The nose came up and the airplane dropped a wing, struck the water in a nose-low attitude, and came to rest inverted in shallow water. Both occupants were wearing seatbelts. The operator in the front seat, who was not a licensed pilot, was unhurt. The passenger in the rear seat received minor injuries. The airplane sustained substantial damage. *TSB File A07O0152.*

— On June 16, 2007, a Bell 206B helicopter was being used for water bucket operations on a fire near a railroad track. While hovering over the water, 20 ft from shore, visual references were lost and the helicopter moved too far forward in reference to the submerged water bucket. The aft corrective action resulted in the tail rotor hitting the surface of the water, breaking the tail rotor shaft. Tail rotor control was lost and the aircraft did a 360° turn, at which time the pilot shut off the fuel valve. The aircraft descended upright and ditched right upon contacting the water. The main rotor blades hit the roof of the aircraft, which injured the pilot, who was not wearing a helmet. The pilot exited the aircraft and held on to the tail boom before swimming to shore. The aircraft sank inverted in shallow water. *TSB File A07Q0108.*

— On June 24, 2007, a Cessna 207 was landing at a mining strip at Scroggie Creek, Y.T., at the end of a fuel hauling flight. During the final approach, the loaded 150 gal. aluminium tank, which was strapped down in the rear of the aircraft, slid forward, pinning the pilot against the control column. The pilot did not have sufficient range of travel of the column to accomplish a complete flare on landing, and the aircraft landed hard while drifting sideways. The aircraft departed the left side of the runway where it struck a loader tire. *TSB File A07W0117.*

— On July 4, 2007, a Grumman-Schweizer G-164A Ag-Cat was conducting aerial agricultural spray operations approximately 7 NM southeast of Lloydminster, Alta. During a reversal manoeuvre to line up for the next pass, the aircraft struck the field. The pilot sustained serious injuries and the aircraft was substantially damaged. *TSB File A07W0126.*

— On July 12, 2007, a Piper PA28 took off from the Saint-Hubert, Que., airport for a local visual flight rules (VFR) flight, with only the pilot on board. During a touch-and-go at the Sorel, Que., airport, the aircraft landed on its belly and sustained significant damage; the landing gear had not extended. The pilot was not injured. *TSB File A07Q0126.*

— On July 22, 2007, the pilot of an R44 helicopter had landed at a private residence in St-Anicet, Que., to pick up a passenger. On takeoff, at approximately 10 ft above ground level (AGL), the main rotor struck an overhanging tree branch. The front cabin area of the helicopter came to rest on its right side, suspended over the water on a stone wall. The rear portion of the helicopter remained on land. The passenger was unhurt. The pilot was initially unconscious and was assisted out of the helicopter, taken to the hospital by ambulance, and kept overnight for observation. The aircraft was substantially damaged. *TSB File A07Q0133.*

— On July 24, 2007, a Bell 206-L1 helicopter was operating in the vicinity of Eagle Plains, Y.T. During an attempt to touch down in a swampy area, the right bear paw got hung up, resulting in a dynamic rollover to the right. The pilot and passenger were not injured; however, the helicopter was substantially damaged. *TSB File A07W0140.* △

Aviation Safety: An Important Concept for Transport Canada

by Carmelle Salomon-Labbé, Acting Officer Advisory and Appeals, Policy and Regulatory Services, Civil Aviation, Transport Canada

For this issue, the Advisory and Appeals Division has chosen two decisions rendered by the Transportation Appeal Tribunal of Canada (TATC) that deal with aviation safety. As usual, the names of the people involved in these matters have not been provided, as the purpose of this article is to inform and educate the aviation community.

Case #1

In the first decision, released in the fall of 2006, the Minister laid charges against a pilot for landing on a runway when there was an apparent risk of collision with another aircraft in the landing path. In doing so, the accused pilot breached *Canadian Aviation Regulation* (CAR) 602.19(10), which clearly stipulates the following:

"No person shall conduct or attempt to conduct a take-off or landing in an aircraft until there is no apparent risk of collision with any aircraft, person, vessel, vehicle or structure in the take-off or landing path."

The facts of the case can be summarized simply as follows: the pilot-in-command of a Piper Cherokee landed on a runway while another aircraft, a Beech Musketeer, was on the same runway.

It was demonstrated at the hearing that the following factors posed a risk of collision:

- there had been no communication or co-ordination between the two pilots who landed on the same runway;
- due to the crosswinds, the run had to be longer than usual;
- the accused pilot failed to call in on final, and as a result, found himself behind the Beech Musketeer at one point, and at another point, even found himself opposite the Beech Musketeer;
- the distance between the aircraft involved was such that, had there been a mechanical failure, a collision could have occurred. At one point, they were only 18 seconds apart from each other.

In his decision, the TATC Member said that, given the weather conditions, the landing pilot should have extended his downwind run in order to eliminate the risk of collision, and also should have called in on final and made sure the Beech Musketeer was no longer on the runway. The TATC Member further stated that the pilot did not exercise all due diligence during this incident.

Clearly then, this case is one that goes to the heart of "aviation safety," a concept that is an integral part of Transport Canada's mandate.

Case #2

The second case was released in 2007 and involves three offences.

Upon receipt of a complaint, an investigation was conducted and revealed that the owner of an amateur-built airplane had committed the following infractions:

1) The owner acted as a flight crew member when he did not have a valid licence or permit, thereby contravening CAR 401.03(1);
2) He operated his aircraft without a valid flight authority, which is contrary to CAR 605.03(1); and
3) He did not subscribe for liability insurance, as prescribed by CAR 606.02(8)(a).

It is interesting to note that the Minister had already charged the owner for infractions 1 and 3 in the past.

Furthermore, when the infractions were committed, the owner's amateur-built aircraft was subject to a detention order issued pursuant to paragraph 8.7(1)(d) of the *Aeronautics Act*. The Minister had reason to believe that, if flown, the aircraft would pose a threat to public safety. Despite his formal undertaking to meet the conditions enunciated in the notice of detention, the owner operated the aircraft on his land, behind his residence.

At the hearing, the owner admitted that, on the date specified in the notice of assessment, he had operated his aircraft in violation of the CARs. In order to exonerate himself from the charges, he explained that, on that day, he had flown the aircraft unintentionally and had done everything necessary to avoid committing the offence. However, as a consequence of the high winds, the aircraft took off on its own. The defence put forward before the TATC was not accepted. The TATC Member found that, given his experience, the owner knew, or ought to have known, that in operating his aircraft in the high winds, his aircraft could have taken off. The TATC Member further stated that the whole incident could have been avoided had the owner followed the prescribed flight procedures to land his aircraft after it took off.

In the end, the TATC Member was satisfied that all three offences had taken place, but reduced the total fine the Minister had imposed on the owner by two thousand dollars.

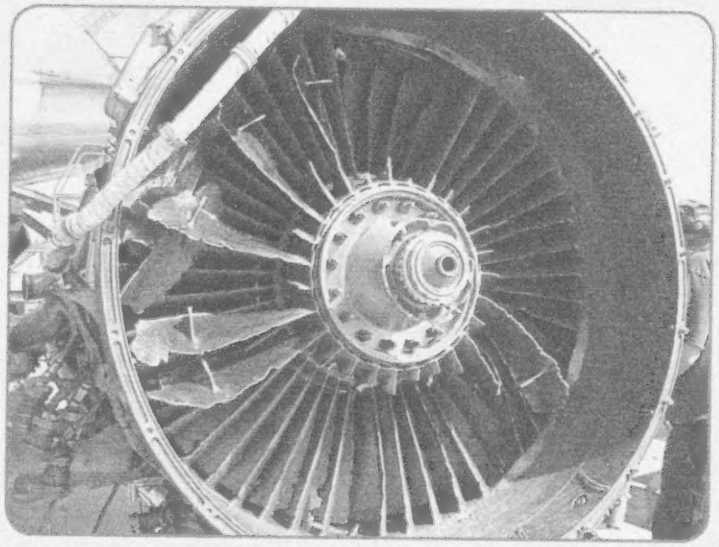
The owner argued that he had been duly diligent in taking all reasonable precautions to avoid the infractions, but the TATC did not accept his arguments.

This is a good example of a case dealing with detention orders issued pursuant to paragraph 8.7(1)(d) of the *Aeronautics Act*. The lesson learned from this decision is that if you formally promise to comply with conditions set out in a notice of detention, you must honour your promise; otherwise, your non-compliance can come back to haunt you, should a matter proceed before the TATC. In this second decision, the owner's non-compliance with the detention order, as well as the other offences he committed in the past, were factored in when the sanction was imposed. △

Pilots Beware: Geese Are in the Air

by Monica Deveau, Co-op Student from the University of Waterloo, Aerodromes and Air Navigation Standards, Standards, Civil Aviation, Transport Canada

Seniors are not the only ones taking to the sky. That's right, spring is arriving and Canada geese will once again be on the move, although not for as long as the fall migration, they will certainly be in large numbers. In fact, a report by the United States Department of Agriculture, Wildlife Services suggests the population of Canada geese in the U.S. and Canada has increased fourfold from 1970 to 2007. The same report provides a jaw-dropping population estimate of 5.8 million Canada geese, with 61 percent, or 3.5 million, of these birds no longer wasting energy on migration due to a variety of issues, including climate change. Many geese remain year-round in some of North America's major cities. This is a reminder to all pilots that exposure to Canada geese is high.



A Canada goose strike with a B-727-200, resulting in the destruction of the engine. Photo by Bob Johnson.

Remember to take all precautions necessary to avoid striking the big bird (typically weighing 8-10 lbs, and beyond the certification requirements for almost all aviation engines, windshields, and airframes). Canada geese are a serious hazard because of their size, ability to fly in large flocks at relatively high altitudes, and attraction to large, open, grassy areas typically found on and near airports. As several reports from the U.S. suggest, the damage a goose can cause to an aircraft is significant. On March 22, 2006, an Airbus A319 struck and ingested one or two Canada geese while on 2-mi. final. The engine was shut down and the pilot declared an emergency. Fire trucks were called to the scene and followed the aircraft to the gate. The crew at this point was unaware that the engine failure was related to an impact with geese. The cost of repair for this incident was estimated at $2,675,600 (U.S.).

Another event involving a goose and an aircraft occurred on August 3, 2006. During takeoff, a Cessna Citation 560 ingested a goose in the left engine, resulting in an uncontained failure. The aircraft departed the runway during the aborted takeoff. The top cowling and fan were damaged to the extent that they needed to be replaced. The aircraft was taken out of service for about 13 days, with costs estimated at $750,000 (U.S.). The final accident addressed in this article occurred on December 29, 2006. This event involved a Canada goose and a Vans Aircraft RV-4. When the goose and aircraft collided, damage was done to the propeller, a wing, the fuselage, the landing gear, and the tail. However, when the bird impacted the propeller, the aircraft began to shake violently. The pilot returned to the airport and was approaching high and fast, so he attempted a go-round. He unfortunately lost control of the aircraft and hit the ground 500 ft beyond the departure end of the runway. Both pilot and passenger received serious injuries. The estimated cost of this accident was about $30,000 (U.S.).

As can be seen from these real-life scenarios, a collision with Canada geese can ruin your day, so please remember to stay alert because geese are taking to the air. △

AVIATION SAFETY IN HISTORY

1907—The Helicopter's Chaotic Beginnings

by Guy Houdin, Chief, Aviation Terminology Standardization, Policy and Regulatory Services, Civil Aviation, Transport Canada

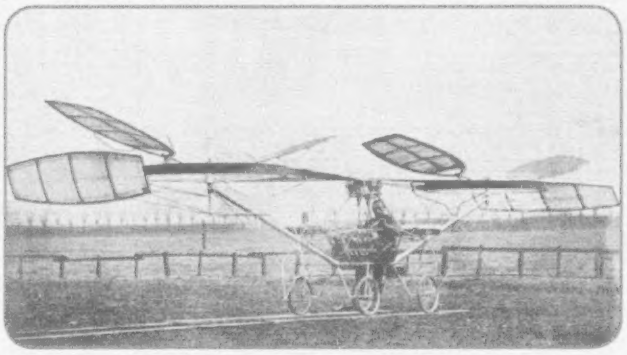
In those days, the safety of humans and machines was a concept that was buried in the subconscious. What mattered most was rising up, flying in the air, and landing without damaging the machine, or "beating up" the pilot. But first, the sky had to be conquered and mastered.

On July 14, 2007, I was watching the military parade, celebrating France's National Day in Paris, on television. Approximately one hundred aircraft had been invited to the event. The airplanes started the procession down the Champs-Élysées, followed by the troops on foot and in vehicles, and then about 30 helicopters brought up the rear. When you could barely see them, high above the La Défense office towers, the reporter mentioned that 2007 was the 100th anniversary of rotary wing flight. Today, this flying machine is found in the sky everywhere; it is used in theatres of military operations, in sea and mountain rescue operations, in the transport of goods and personnel to areas that are otherwise inaccessible, and in firefighting operations—it is part of our visual landscape.

Yet, how many people know the name of the person who made the first free flight? His name is Paul Cornu. Paul (1881–1944) was, just like his father before and with him, an inspired handyman and inventor; they both sold cycles and repaired bicycles and sewing machines. At 14, he invented an incubator temperature control system, and later a motorized tricycle, a thermal clock, and, with his father, an "ultralight cart" with two engines, which reached a speed of 70 km/h. In 1905, Paul Cornu became interested in aviation. Everyone has heard of Leonardo da Vinci's drawings, and his dreams of flying machines and all kinds of ornithopters. However, it was only four centuries later that his intuitions took shape. Cornu first perfected a 14-kg scale model, equipped with a 2-hp Buchet engine; a replica of the machine on board of which, on November 13, 1907, he would conduct the first free flights with an engine and pilot on board—one up to 30 cm above the ground, and the other up to 1.50 m.

Paul Cornu
Photo courtesy of http://www.bmlisieux.com, *with permission.*

The machine weighed 203 kg, and was powered by a 24-hp Antoinette engine, that rotated at 900 rpm. It was made up of two rotors that were six metres in diameter, and powered by a 22-m belt, and "deflector planes" that would allow for directional control and turning. Even though Paul Cornu and his brother were the only ones to witness this first successful flight, and although others before him—such as Léger in Monaco, Bréguet and Vollumard in Douai, France—had some good, but less convincing, attempts, historians retained November 13, 1907, as the birth date of free flight by a rotary wing aircraft.



Paul Cornu's helicopter
Photo courtesy of http://www.bmlisieux.com, *with permission.*

Knowledge and technique slowly improved. In Issy-les-Moulineaux, France, in the early 1920s, Raoul Pateras conducted a five-minute flight, skimming the ground, and thought up the "possibility of autorotational landing." In 1923, the Spaniard Juan de la Cierva discovered how to make the "autogyro" sustain controlled flight, using hinged blades. But it was at the end of the Second World War, thanks to Sikorsky, an American engineer born in Russia, that the helicopter went beyond being a dream and a prototype to enter into an era of technical and functional efficiency. Fulfilling civil and military missions in areas where airplanes are of no use, these machines, which are able to hover and land on a postage stamp, have become vital. Many people who have been careless in the mountains, or devastated by natural disasters or accidents, owe their lives to these machines that bring hope from the sky.

The French version was based on information taken from: http://fr.wikipedia.org/wiki/Paul_Cornu *(the list of authors may be found at* http://fr.wikipedia.org/w/index.php?title=Paul_Cornu&action=history*), and on the article "Il y a cent ans, volait le premier hélicoptère,"* Air & Cosmos, *Issue 2087, July 20, 2007.* △

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Five minutes reading could save a life

Snow Landing and Take-off Techniques for Helicopters

Throughout the course of winter operations, helicopters face a significant hazard associated with takeoffs, landings and hovering when the ground is covered with fresh or light snow. The rotor down wash can produce a flurry of re-circulating snow, reducing local visibility and causing whiteout conditions. There seems to be limited reference material available on the subject, but the following techniques are used by the industry as standard practice.

The towering takeoff

When conducting takeoffs in conditions conducive to re-circulating snow, apply enough power to get the snow blowing while keeping enough weight on the aircraft to prevent it from moving. Leave the power on as long as necessary to get good visual references. This could take up to a minute to accomplish.

Once good references are established, use a towering take-off technique (altitude over airspeed) to stay out of the re-circulating snow during the remainder of the departure procedure.

If the aircraft is equipped with a wheeled undercarriage and a runway is available, a rolling takeoff could be another option.

The rolling takeoff

Prior to starting the take-off roll, apply power to blow the runway clear in the vicinity of the aircraft — this will give you some reference for the start of the take-off roll. When ready for takeoff, apply enough power to get the aircraft accelerating ahead of the re-circulating snow. When ahead of the snow, lift the aircraft into the air, accelerate to the aircraft's normal climb speed and follow the normal climb profile.

- Use this technique when the snow cover is light (less than approximately 5 cm), and the snow is relatively dry. Deep or heavy snow could impose excessive load on the landing gear.

Landing: high-hover technique

Before using this technique, ensure that the aircraft is at a weight that will allow hover out of ground effect performance. If the aircraft is flying in clear air prior to the approach, activate the aircraft's anti-ice systems (if equipped) prior to entering the re-circulating snow.

Plan your approach to arrive in a high hover above the landing site. This hover could be several rotor diameters above ground depending on snow conditions, aircraft weight, rotor diameter, and aircraft type.

When in a high hover, the re-circulating snow will form beneath the helicopter, obscuring the landing site. This re-circulating snow will also rise; be sure to stay above the rising snow and wait until solid references appear beneath the aircraft. This could take up to a minute. These references are directly under the aircraft and within the diameter of the rotor disc. Once solid references have been obtained, a slow vertical descent to a touchdown is all that is required.

Canada

Landing: no-hover technique

This technique is generally used when aircraft do not have hover out of ground effect performance. The idea is to fly the approach fast enough to keep ahead of the re-circulating snow and complete a no-hover landing before the re-circulating snow engulfs the aircraft, causing local whiteout conditions.

Some of the negative aspects of this technique:

- Requires excellent timing—usually only one chance at getting it right.
- May not be able to get a detailed look at the touchdown area prior to landing.
- Not recommended for use at night helipads because of the reduced visual references required for judging the landing flare.

The run-on landing

A run-on landing could be another option, if your aircraft is equipped with a wheeled undercarriage and you are landing on a runway.

The technique is to fly the approach fast enough to keep well ahead of the re-circulating snow. On touch down, the aircraft has to have enough forward speed to stay ahead of the re-circulating snow and allow the collective to be fully lowered (lowering the collective reduces the re-circulating snow). Bring the aircraft to a full stop and taxi with caution.

- Use this technique when the snow cover is light (less than approximately 5 cm), and the snow is relatively dry. Deep or heavy snow could impose excessive load on the landing gear.

Safety first

Landings and takeoffs in re-circulating snow require skill, training, and adherence to the following safety points:

- Be certain you have sufficient power available to permit the manoeuvre.
- Ensure that the skids or wheels are not frozen to the ground prior to lift off to prevent dynamic rollover.
- Observe the flight manual and company operations manual limitations. In the transport category, the height-velocity diagram is a limitation and must be respected. In other helicopters, it should be considered in your planning.
- When using the towering takeoff or high-hover landing technique, be patient. Wait for solid references to appear before proceeding.
- Practice landings and takeoffs using references that are inside the diameter of the rotor disc.
- Obtain training from a qualified training pilot or flight instructor before using the techniques described here.

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